TRINIDAD AND TOBAGO.

Council Paper No. 50 of 1938.

DEPARTMENT OF AGRICULTURE.

Administration Report of the Director of Agriculture for the year 1937.

Laid before the Legislative Council on the 20th of May, 1938.

IMPERIAL MYCOLOGICAL INSTITUTE
15 SEPT. 1938

Previous Council Paper No. 47 of 1937.

Registered No. of Correspondence relating to the subject—M.P. No. 38191.

1938.

TRINIDAD AND TOBAGO.
PRINTED AND PUBLISHED BY A. L. RHODES, M.B.E.,
GOVERNMENT PRINTER.

[Price 60c.]

REPORT OF THE DEPARTMENT OF AGRICULTURE FOR THE YEAR 1937.

CONTENTS.

PAGE.

PART I.—ADMINISTRATION REPORT OF THE DIRECTOR OF AGRICULTURE—

Agricultural Exports 3
Departmental Institutions, District Work and other Activities 8
Revenue and Expenditure 18
Staff 18

PART II.—DIVISIONAL REPORTS—

Report of Agronomist 20
River Estate 32
St. Augustine Nursery 42
St. Augustine Experiment Station 44
Report of Curator, Royal Botanic Gardens 49
Government Stock Farm, Trinidad 51
Report of Veterinary Division 60
Report of Plant Pathologist 65
Report of Entomologist 71
Report of Sugar-Cane Agronomist 72
Wilt Disease of Coconuts 75
Citrus Studies 76

PART III.—ANNEXURES—

Revenue and Expenditure, 1937 78
Agricultural Exports, Trinidad and Tobago 79
Annual Rainfall, Port-of-Spain, Trinidad 80
Agricultural Labour—Rates of Wages 81

DEPARTMENT OF AGRICULTURE.

Administration Report of the Director of Agriculture for the year 1937.

Council Paper No. 50 of 1938. *M.P. No. 38191.*

I.—AGRICULTURAL EXPORTS.

It is of interest to compare the average value of the agricultural exports of the colony for the three years 1926, 1927 and 1928—a period prior to the world-wide trade depression—with the values for recent years. The 1926-1928 average was £2,902,645 ; the value in 1935 was £1,696,423 ; in 1936 it rose to £2,066,268 ; and in 1937, the year under review, there was a further advance and the total value of the agricultural exports was £2,329,549.

2. Of the three major agricultural export industries, sugar and its by-products headed the list of exports with a value of £1,338,692, or slightly more than in 1936 ; compared with 1936, cocoa rose in value to £643,123 from £487,578 ; and coconuts, copra and other coconut by-products increased to £136,069 from £67,670. Detailed figures for 1936 and 1937, as well as the averages for 1926-1928 are given in the following table :—

Agricultural Exports.

Article.	1926-1928 average yearly value.	1936 Value.	1937 Value.
	£	£	£
Sugar and By-products	1,014,677	1,338,651	1,338,692
Cocoa	1,531,148	487,578	643,123
Coconuts and Coconut Products	223,768	67,670	136,068
Coffee	12,833	17,702	28,074
Limes and Lime Products	6,056	26,852	54,148
Grapefruit and Oranges	2,028	46,111	42,752
Grapefruit and Orange Juices	...	4,080	8,654
Bananas	...	14,797	16,027
Tonka Beans	1,824	31,002	21,593
Pulses, Beans and Peas	4,816	2,600	1,737
Livestock and Hides	8,441	7,436	4,652
Bitters	76,862	15,953	23,537
Miscellaneous	20,192	5,831	10,492
	£2,902,645	£2,066,263	£2,329,549

SUGAR.

3. Sugar production amounted to 154,285 tons of which approximately 12,000 tons were retained for consumption in the colony. The exports of sugar, molasses and rum in 1937 were valued at £1,338,692 or 57 per cent. of the total agricultural exports and double the value of the exports of cocoa.

Sugar Production.

4. Production figures for the past ten years were as follows :—

	Tons.
1928	81,551
1929	89,926
1930	79,848
1931	98,573
1932	97,598
1933	120,763
1934	105,342
1935	117,780
1936	154,665
1937	154,285

Exports and Values of Sugar and Sugar By-products.

5. The quantities and values of the exports of sugar, rum and molasses for the years 1928-1937 are given below.

	Sugar.		Molasses.		Rum.		Prices Grey Crystals f.o.b. per ton.
	Exports.	Value.	Exports.	Value.	Exports.	Value.	
	Tons.	£	Gals.	£	Gals.	£	£ s. d.
1928	74,112	1,201,477	1,622,018	16,913	55,088	12,157	14 10 0
1929	81,503	1,049,863	1,373,420	18,227	73,841	13,639	11 10 0
1930	69,138	776,167	899,051	11,238	72,063	14,313	10 5 0
1931	86,054	902,990	1,599,414	15,924	86,260	15,719	9 0 0
1932	85,956	845,974	2,701,921	14,697	139,540	27,521	9 14 2
1933	108,516	1,115,567	3,026,077	31,634	63,907	12,853	9 10 0
1934	93,513	916,232	2,310,381	24,115	50,977	11,488	8 13 10
1935	105,699	942,171	3,199,524	32,226	6,282	3,328	7 12 6
1936	142,671	1,276,579	3,909,009	41,623	90,185	20,449	7 14 7
1937	142,747	1,274,019	4,258,934	45,953	109,860	18,720	9 2 6

Prices of Sugar.

6. There was an appreciable increase in the price of sugar during the first half of 1937, the average f.o.b. price per ton of grey crystals being £9 2s. 6d. for the six months January to June as compared with £7 14s. 7d. for the corresponding period of the previous year.

Cane Farming Industry.

7. The number of cane farmers engaged in the cultivation of sugar cane for supply to the factories was 20,705 of which 13,822 were East Indians and 6,883 West Indians, and they sold 629,881 tons of canes as compared with 594,176 tons in 1936. At the basic price of 11s. per ton, the farmers received £346,434 compared with £326,796 in the previous year.

8. A total of 1,442,910 tons of canes were ground of which the sugar manufacturers produced 813,029 tons, or 57 per cent., and the farmers 629,881 tons or 43 per cent.

International Agreement.

9. World rationalisation of the exports of sugar had been under discussion since the abandonment of the Chadbourne Scheme and an international Conference was convened by His Majesty's Government early in 1937 to consider the principle of restriction and the ways and means. An agreement was reached by the countries concerned and quotas decided upon. Trinidad's allocation was 138,000 tons per annum subject to such modifications as may later become necessary. Legislation was enacted in the colony in the form of the Sugar Quotas Ordinance No. 12, 1937 and the Cane Farming Control Ordinance No. 13, 1937, for the purpose of controlling exports and production.

Importance of the Sugar Industry.

10. Sugar production has played a very important part in mitigating the economic difficulties that have followed the decline in the quantity and value of cocoa exports, and it is of interest to note that the largest sugar company operating in the island employs more labour than the oil industry as a whole.

COCOA.

11. In 1937 the quantity of cocoa exported was 26,258,622 lb. as compared with 28,339,195 lb. in 1936, and the value was £643,123 in 1937 as against £487,578 in 1936

12. Exports and prices during the 10 years, 1928 to 1937 were as follows:—

	Exports.	*Value.*	*Price per fanega* (110 lb.)*
	lb	£	£ s. d.
1928	58,008,156	1,651,179	2 15 0½
1929	61,888,740	1,446,127	2 5 9½
1930	53,825,120	1,136,056	1 18 11
1931	57,186,512	826,333	1 8 8
1932	41,822,127	579,170	1 8 11
1933	51,311,274	555,907	1 0 11½
1934	26,803,149	349,694	1 6 10
1935	44,387,836	527,212	1 3 11½
1936	28,339,195	487,578	2 2 9½
1937	26,258,622	643,123	2 6 1

* Monthly average.

Prices.

13. The average price for the year under review is misleading as the level reached during the main crop period—January to May—ranged from £3 3s. 1d. to £2 9s. 0d. per fanega (110 lb.). It is seven years since cocoa growers have had the benefit of a price that approximated to the average for some 50 years prior to 1930. The recovery in price was welcomed by all connected with the cocoa industry. A revival of interest and effort on the part of growers was the result; and it is to be deplored that towards the end of the year prices fell to the uneconomic figure of £1 8s. 6d. per fanega (110 lb.)

14. Trinidad has been unfortunate in that the appearance on its staple industry of a new and serious disease was coincident with the beginning of the world depression in prices that started in 1929. At a period when funds were urgently needed for disease control measures, market prices were inadequate to meet normal production costs.

15. Cocoa growers and those interested in their welfare who recollect the abortive efforts to have the Z scheme adopted, and who have learnt of the acceptance of the International Agreement controlling the exports of sugar, cannot but wonder whether it is, in fact, impracticable for the comparatively few countries interested in the cultivation of cocoa to combine for the purpose of formulating and giving effect to a scheme of rationalisation. Such a scheme appears to be the only means of ensuring for the colonial producer returns on a level commensurate with the part he plays as the foundation of the cocoa and chocolate trade of the world.

16. Perhaps, I might digress and refer to an incident related to me. In March 1937, when cocoa prices had risen, a small proprietor went into a store and asked for a thermos flask. The clerk had not adjusted himself to the freer circulation of money due to the flutter in cocoa values and offered him a 1s. 3d. flask. The customer looked around and ended up by buying a 36s. lunch basket. A significant lesson in Empire trading: when 3d. per lb. was received for cocoa, 1s. 3d. was spent on an imported manufactured article: when 6d. per lb. was received, 36s. was spent.

Cocoa Subsidy.

17. The year under review was the second year of the cocoa subsidy scheme. The sum of £76,041 was distributed in free grants to 9,107 cocoa estates. The higher price for cocoa and the cocoa subsidy grants, which had to be expended on a definite programme, resulted in a better standard of work on selected fields than was possible during the protected period of depressed values for cocoa

18. The Board arranged for a survey of the drainage requirements of estates with the intention of insisting that a substantial proportion of the grants in 1938 is to be utilized on the improvement of drainage on individual estates. Attention was also given to the need for district drainage schemes to mitigate the annual loss that occurs from flooding. A preliminary survey was made of the Sangre Grande area by the Acting Drainage and Irrigation Engineer and a beginning was made in clearing the Oropouche River.

Witchbroom.

19. Owing to a long period of drought, witchbroom disease was not as prevalent as in the previous year, but the loss of crop due to the disease continued to be heavy, especially in certain areas, and abandonment of cocoa in these areas is inevitable.

Expedition in search of Witchbroom Resistant Strains of Cocoa.

20. Funds were contributed jointly by this Government and the Colonial Development Committee to provide for an expedition to visit South America in search of strains of cocoa resistant to witchbroom. The Cocoa Agronomist, Dr. F. J. Pound, spent from April to August in Ecuador and set out for Brazil and Peru in November. A report on the result of the expedition to Ecuador was published as Council paper No. 115, 1937. Fuller reference is made to this subject under the Report of the Agronomist.

COCONUTS.

21. Exports of copra, coconuts and coconut oil—converted into terms of nuts—amounted to 57,747,999 nuts as compared with 33,299,568 in 1936. The value in the two years was, respectively, £136,069 and £67,670. Exports of coconuts, copra and coconut oil for the past ten years are given below:—

	Coconuts.		Copra.		Coconut Oil.		Price of Copra.
	Exports.	Value.	Exports.	Value.	Exports.	Value.	
	Nuts.	£	*lb.*	£	*Gals.*	£	100 *lb.*
1928	6,799,655	34,824	21,351,860	227,555	65,285	11,860	20s.
1929	13,608,118	66,320	23,979,882	209,732	34,707	5,403	17s.
1930	5,886,127	25,830	21,891,259	175,965	41,154	5,938	14s.
1931	4,487,875	12,549	19,484,808	101,148	20,702	1,818	8s. 9 d.
1932	3,847,245	12,822	15,418,906	91,444	26,461	2,520	10s. 2½d.
1933	7,888,980	21,406	19,357,980	82,945	45,565	3,658	9s. 5¼d.
1934	9,850,299	29,128	17,928,775	57,451	31,118	2,244	5s. 10 d.
1935	5,376,290	14,393	8,764,646	34,682	14,879	1,339	8s. 6½d.
1936	4,560,180	14,529	9,438,240	51,798	9,437	1,343	11s. 5½d.
1937	5,020,665	20,693	17,277,008	113,083	19,918	2,292	11s. 11½d.

Bonus to Copra Producers.

22. The bonus distributed under the agreement with the oil factories was no more than £2,094 due to the fact that for the greater part of the year the price of copra was over 12s. 6d. per 100 lb.—a price at which the bonus to copra producers ceases under the terms of the agreement with the factories. During the period under review approximately 9,000,000 lb. of copra were handled by the local factories manufacturing edible oil and lard substitutes.

Prices of Copra.

23. In January the price of copra per 100 lb. rose to 17s. but by the end of the year it fell to 10s. 5d.

Coconut Wilt.

24. Wilt continues to prove disastrous to coconut palms growing on certain soil-types. A bulletin by Mr. F. M. Bain, Agricultural Officer, embodying, the results of his investigational work and listing the types of soil on which the disease occurs was published during the year. A summary of the conclusions drawn by Mr. Bain regarding the cause of this trouble will be found in Part II.

LIMES AND LIME PRODUCTS.

25. The total value of the exports of lime oil, lime juice, citrate of lime, and green limes was £54,148 in 1937 as against £26,852 in 1936. The increase was due largely to the stocks of lime oil held over from 1936. As the figures below show, the industry is dependent almost entirely on the sales of lime oil and the future must be viewed with some apprehension unless a larger market can be found for green limes

Exports of Limes and Lime Products.

Lime Oil.

	Exports. Gals.	*Value.* £
1928	495	5,894
1929	797	9,516
1930	1,647	19,457
1931	2,413	32,071
1932	929	12,840
1933	1,889	22,575
1934	2,882	25,055
1935	1,949	15,497
1936—Distilled	22,016 lb.	17,702
—Handpressed	779 lb.	1,430
1937—Distilled	46,429 lb.	46,075
—Handpressed	1,222 lb.	2,023

Lime Juice.

	Concentrated Juice.		Raw Juice.	
	Exports.	Value.	Exports.	Value.
	Gals.	£	Gals.	£
1928	5,653	1,487	Nil	Nil
1929	55,455	11,562	Nil	Nil
1930	21,762	3,759	47,554	4,096
1931	4,012	458	22,931	2,007
1932	8,583	427	46,629	4,250
1933	11,709	622	17,375	1,203
1934	9,110	535	3,479	294
1935	4,422	393	11,807	806
1936	3,521	321	66,881	4,758
1937	5,780	491	25,082	1,609

Citrate of Lime.

	lb.	£
1932	54,217	424
1933	52,800	389
1934	96,693	641
1935	104,037	901
1936	23,716	169
1937	203,728	2,358

Green Limes.

	Barrels.	£
1932	189	145
1933	2,102	2,381
1934	1,439	1,991
1935	565	801
1936	1,391	2,472
1937	923¾	1,592

GRAPEFRUIT AND ORANGES.

Exports and Values.

26. The exports and value of grapefruit for the past ten years are as follows:—

	Exports. *Boxes.*	*Value.* £
1928	23	45
1929	807	606
1930	2,184	910
1931	4,377	1,874
1932	10,973	8,978
1933	3,433	2,586
1934	23,518	18,634
1935	51,119	
loose fruit	7,724	42,473
1936	42,958	41,357
1937	45,210	
loose fruit	27,186	39,078

27. Export of oranges amounted to 1,748 boxes and 2¾ million loose fruit valued at £3,674.

28. The grapefruit crop during 1937 was greater than that of the preceding year but prices received were disappointing. The crop was much earlier than usual and it was necessary to make large shipments at a time when price levels were low owing to the large quantities of Palestine fruit at that time on the market.

29. During the 1936-37 season the Co-operative Citrus Growers' Association, which handles the whole of the crop, shipped 43,579 cases of grapefruit and 2,454 cases of oranges making a total of 46,033 cases, compared with 40,954 cases of grapefruit and 2,329 cases of oranges or a total of 43,283 cases for the preceding season.

30. The actual crop was considerably greater than these figures indicate, for the 1936-37 season the canning plant of the Association was enlarged and handled 26,000 field crates of fruit, producing 600,000 cans of grapefruit hearts and juice as compared with 7,000 crates in the 1935-36 season.

31. It is a healthy sign that the central packing house of the Citrus Growers' Co-operative Association is again in need of extension and proposals have been submitted to Government for a loan to provide for enlargement of both the packing unit and the canning plant and for the installation of additional machinery and equipment. It is confidently expected that the crop of 1937-38 season will be well in advance of that of the past year.

32. Market reports continue to bear testimony to the excellent quality of Trinidad grapefruit packed by the Association.

32A. It is regrettable that scab disease (*Sphaceloma fawcetti*) has made its appearance on grapefruit in the Santa Cruz Valley.

COFFEE.

33. In recent years robusta coffee has been inter-planted in cocoa on a comparatively large scale and the jump in exports reflects the fact that the young plantings are coming into bearing. The market price was low.

34. For the past ten years the quantities and values of coffee exports were as follows :—

	Exports.	*Value.*
	lb.	£
1928	265,410	10,883
1929	817,983	32,309
1930	491,988	12,525
1931	857,920	16,276
1932	908,492	20,822
1933	339,196	7,416
1934	525,115	10,595
1935	1,187,867	18,290
1936	1,213,184	17,702
1937	1,752,882	28,074

TONKA BEANS.

35. Tonka bean exports in 1937 showed a decrease compared with the previous year. The planting of this crop on areas unsuited to cocoa continues.

36. The exports and value for the past ten years are as follows :—

	Exports.	*Value.*
	lb.	£
1928	884	147
1929	15,266	2,544
1930	9,219	1,538
1931	22,950	3,583
1932	69,276	12,993
1933	9,979	3,004
1934	45,450	14,822
1935	37,968	12,320
1936	92,719	31,002
1937	71,539	21,593

BANANAS.

37. Regular fortnightly shipments of bananas were continued under the agreement with the Canadian Banana Company. A total of 157,740 bunches valued at £16,027 were exported in 1937 compared with 159,085 bunches valued at £14,797 in 1936.

38. In May, as a result of representations made by the Fruit and Vegetable Conference, the contract price was raised by the Canadian Fruit Company to 54 cents per count bunch at the Wharf. The increase applied to eight hands and over.

39. Cercospora leaf spot is proving a serious menace to the cultivation of bananas in Trinidad.

II.—DEPARTMENTAL INSTITUTIONS, DISTRICT WORK, AND OTHER ACTIVITIES.

RIVER ESTATE.

40. During 1937 the policy outlined in the report for 1936 has been continued and areas unsuitable for cocoa are being steadily replaced or interplanted with alternative crops—principally tonka beans, limes and coffee. It is the intention to retain ultimately some 330 acres in cocoa all of which will be devoted to fertiliser and other trials. In conformity with this policy the area under limes has been considerably increased, an area of cocoa has been cleared and planted with grapefruit, and tonka beans and robusta coffee have been planted through some of the poorer cocoa sections.

41. The report of the Manager, Mr. R. O'Connor, will be found in Part II of this report. Total revenue for the year from the estate amounted to the record sum of $25,640. Of this sum $7,217 were obtained from crops other than cocoa. Expenditure amounted to $27,505 in which is included a sum of $8,449 representing capital expenditure, cost of experimental work on subsidiary crops, and maintenance of timber plantations.

42. The increase in revenue was due to record crops of limes, grapefruit and oranges and to good prices for cocoa during the first half of the year.

43. The cocoa crop amounted to 1,011 bags produced on 397 acres which is equivalent to 2.55 bags per acre. This compares with a yield of 2.63 bags per acre obtained in 1936 and 2.94 bags per acre in 1935. The reduction in the crop was in part due to abnormally dry weather experienced during the latter part of the year.

44. Witchbroom disease continued to increase in intensity and the incidence of pod infection is becoming more pronounced.

45. Three thousand nine hundred and forty-four crates of grapefruit were marketed through the Co-operative Citrus Growers' Association and 536 cases of oranges were produced. The lime crop totalled 2,009 barrels compared with 1,581 barrels in 1936, the increase in crops being largely due to the newer planted areas coming into bearing.

46. Details of the various experiments, both cultural and manurial, on the various crops under cultivation at River Estate will be found in the report of the Agronomist. A summary of the results obtained to date is given below.

Cocoa Spacing Trials.

47. These trials have now completed 20 years; the average yield over that period of the spacings 12 by 12, 14 by 14, 16 by 16, and 18 by 18 feet show no significant differences. The spacing 14 by 14 feet gave the highest yield in the twentieth crop.

Seedling Progeny of Tree No. 4927.

48. The object of this trial was to test whether the seedling progeny of a heavy bearing tree inherited the high yielding capacity of the parent. The original tree, during the four years 1913 to 1916, gave 332 pods per annum equivalent to approximately half a ton of cocoa per annum. Over the past eleven seasons the progeny, 178 trees, has yielded at the rate of 756 lb. per acre which is well above normal for the estate (450 lb. per acre).

Propagation Experiment.

49. This trial has been laid down to determine the comparative merits of seedlings, budded and grafted trees of the same parents under estate conditions. The differences in yield obtained are not statistically significant though there are indications that with immortel shade vegetatively propagated trees yield larger crops than seedling trees; without overhead shade the converse is the case. During 1937 each unit clone of ten trees was subdivided into two and fertiliser treatment (sulphate of potash and superphosphate) applied to one set of five, the other being left as control. The manured plots gave an increase in the first year of five bags (165 lb.) per 1,000 pickets ($3\frac{1}{3}$ acres).

Colour of Pods.

50. This experiment demonstrates the high yields which young budded trees, grown without overhead shade, can give on a well drained soil without receiving any special treatment or manuring. From such trees yields equivalent to nearly 1,300 lb. dry cocoa per acre were obtained. Further the experiment indicates that "red" types are hardier and more vigorous than the "yellow".

Manurial Experiments.

51. The experimental manurial programme, details of which were given in the Agronomist's report for 1936, has been continued and the results obtained confirm the conclusions previously recorded which may be summarised as follows and which apply to sandy loam soils such as that at River Estate:—

(1) In certain cases the addition of nitrogen as sulphate of ammonia is detrimental; in other cases, while sulphate of ammonia may not reduce yields, both this manure and phosphate reduce the beneficial effect of potash.
(2) Sulphate of potash is highly beneficial and, in addition to marked increases obtained in the years of application, has a pronounced residual effect;
(3) Sulphate and muriate of potash are of equal value;
(4) Phosphate improves the yield when potash is not the limiting factor; when potash is insufficient applications of phosphate may have no beneficial effect;
(5) Nicifos C is of less value than superphosphate;
(6) Pen manure applied as a mulch and lightly forked in gives quicker results than trenching.

Pen manure is known to be extremely beneficial to soils of the River Estate type, it would appear, however, that the benefit derived from this manure is due to its carbohydrate content and not to its nitrogen. To test this hypothesis an experiment has been established to ascertain the effect of applications of sugar as a source of carbohydrate.

Tonka Beans.

52. Fertiliser experiments with tonka beans at River Estate have given disappointing results; trials with mature trees have given no response. Dwarf tonka beans have been discovered of two types, the first being slow growing trees of normal appearance and the other being true dwarfs. The latter type may prove valuable as stocks for the production of dwarf trees with the bearing capabilities of the normal type.

MARPER ESTATE.

53. This estate has been developed by Government with the primary object of investigating the possibility of effecting economic control of witchbroom under estate conditions. Since the estate (93 acres under cocoa) was acquired in 1929 yields have been as under :—

Year ...	1930	1931	1932	1933	1934	1935	1936	1937
Bags (165 lb.)	251	196	211	202	204	292	217	195

54. The former programme of removing and destroying brooms in alternate months was replaced at the beginning of the year by one in which complete rounds were made every three months. The results obtained in previous years proved that witchbroom could be effectively controlled by the former method ; and, in an endeavour to reduce the cost, it was decided to ascertain whether removal of brooms at less frequent intervals would give satisfactory results as judged by the percentage of mature pod infection.

55. The known loss of crop as a result of pod infection during the past six years is given below. It should be noted that the incidence remains at a comparatively low level in contrast to many nearby privately owned estates whose financial position does not permit of the necessary control measures being undertaken :—

Year	1932	1933	1934	1935	1936	1937
Loss per cent. mature witchbroom pods	0.87	1.25	1.33	1.31	3.84	8.67

56. The cost of labour, not including supervision, in removing and destroying brooms during 1937 amounted to $2.90 per acre. It can be stated that work at Marper has demonstrated that witchbroom can be controlled and crops maintained at a satisfactory level provided funds are available to permit of the removal of brooms at regular intervals throughout the year (at a cost of some $3.00 per acre) and provided the owner of the estate is in a position to maintain the cultivation at a reasonable standard, and it is to be deplored that prices ruling for cocoa are such as to debar the majority of privately owner estates from obtaining similar results.

57. One of the primary objects for which the estate was established has been achieved, and it is now the intention to develop at Marper another side of the work on witchbroom, namely the bulking up of material of possible witchbroom resistant strains obtained both locally and from abroad, in order that in time, should the existence of definite resistant strains be proved, supplies of tested planting material may be available for distribution to planters.

58. During the year two acres of cocoa were cut down and the land prepared for planting with the progeny of trees selected for resistance to witchbroom. By the end of the year a small number of such budded plants had been established and the work will be considerably extended during 1938.

59. Supervision of the estate, which is managed by Mr. N. J. Raphael, is undertaken by Mr. B. G. Montserin, Agricultural Officer. The experimental work is controlled by the Agronomist and details of this side of the work of Marper will be found in his report.

ST. AUGUSTINE NURSERY.

60. The report of the Manager, Mr. F. C. Buthn, will be found in the second part of this report.

61. The total number of plants distributed during 1937 was 269,900—an increase of 167,500 over the number issued from the nursery in 1936. The greater part of this increase was due to the large numbers of cocoa seedlings—over 200,000—raised for issue to planters under the Cocoa Subsidy Scheme.

62. The number of citrus plants distributed totalled 16,803, an increase of 1,500 over the number issued in 1936. There was a keen demand for Valencia orange plants, the price of which was reduced in order to assist planters who are undertaking the conversion of cocoa to this crop under the Cocoa Subsidy Scheme.

63. In conformity with the policy adopted in 1935, whereby distribution of seedlings of West Indian limes was restricted to approximately 10,000 annually, 10,730 lime seedlings were issued. The sale of T1 lime plants amounted to 266.

64. The demand for budded varieties of Avocado pears continued, 1,359 plants being distributed, Plants from Avocado trees selected by Dr. Wardlaw, of the Imperial College of Tropical Agriculture, for propagation with a view to making shipments of fruit, have been raised and a plot of the progeny of these selections was established at River Estate. Dr. Wardlaw selected the parents as possessing special qualities that rendered them more suitable for shipment overseas than the ordinary West Indian strains.

65. Six varieties of grape vines introduced in 1936 were planted out.

66. In the ornamental section there has been an increased demand for seedling annuals in boxes which met with a ready sale. The seedling *Bougainvillaeas* grown in 1936 flowered but only one was considered worthy of further trial. Seventy-eight seedlings were raised in 1937 and will be planted out for observation in 1938.

ST. AUGUSTINE EXPERIMENT STATION.

67. The report of the Manager, which is printed in the second part of this report, details the work undertaken at this station during the year.

68. In the citrus experimental block most of the trees are now five years old, and, while it is yet too early to draw definite conclusions from the results, valuable information has been obtained particularly from the manurial experiment as to the comparative response of grapefruit trees to various fertiliser treatments under the soil and climatic conditions which obtain at St. Augustine. For growth, as judged by regular measurements, the greatest response has been obtained from applications of nitrogen and phosphate plus pen manure. Fruiting records demonstrate the value of pen manure, plots so treated yielding nearly four times as heavily as non-pen manure trees. The results also show the influence of potash on inducing not only heavy bearing but also early fruiting.

69. An additional experiment was laid down during the year to determine the optimum time for application of nitrogen and potash.

70. Early in the year an attempt was made to produce sour orange stocks by vegetative propagation. The experiment was a success in that it was established that vegetative stocks can be raised rapidly, but considerable improvements in technique will be necessary before this method can be practised on a commercial scale.

71. Cost of cultivation, excluding capital charges and management expenses, amounted to $39.56 per acre.

72. Work on lime breeding initiated by Mr. R. O. Williams, with the object of producing a lime resistant to wither-tip disease, and possessing the desirable characters of the ordinary West Indian lime, has been continued. It has been necessary to discard the majority of the trees raised from crosses made in 1933; those which show promise have been retained for a more extended trial and for further breeding work. The crosses made in 1936 have been planted out in the field and during June further crosses were attempted, using T.1, T.145, Woglum, Tahiti and West Indian both as male and female parents: some 70 seedlings were obtained which will be planted out in due course.

ROYAL BOTANIC GARDENS AND GOVERNMENT GROUNDS.

73. The duties of the Curator of the Gardens were considerably increased during the year in consequence of a programme of work undertaken to effect improvements to the Queen's Park Savannah and to the grounds of Government buildings in Port-of-Spain.

74. An area of some 20 acres to the north-east and south-west of the "Lookout" was cleared of bush and brought under cultivation; the more desirable forest trees were left and the whole section was developed as grass slopes interplanted with clumps of *Bougainvillaea*. A pathway through natural vegetation has been made from near the St. Ann's entrance to the Gardens leading to Lookout hill—the main ravine being spanned by two rustic bridges. The newly developed area has added considerably to the beauty and attraction of the Gardens.

75. In the Queen's Park Savannah the north-west sunken corner has been developed. Two lily ponds have been constructed and an extensive rock garden has been made planted with various type of flowering annuals and shrubs. A metalled pathway passes through the area which is kept closely mown and, judged by the large numbers who now frequent the "hollow" the public greatly appreciate the alterations effected.

76. In addition, around the perimeter of the Savannah flower beds were prepared and planted with flowering shrubs.

77. Work has been undertaken on the improvement of the grounds of Government buildings in Port-of-Spain for which special funds were provided. The work undertaken consisted in the main of clearing, levelling and planting with turf where necessary, the planting of hedges, and the provision of palms and other decorative plants in pots to those buildings whose grounds were limited in extent. The grounds of the following buildings received attention:—Red House, Audit Office, District Magistrate's Court, Government Printing Office, Wireless and Telegraph Office, Health Office, Woodbrook, Tranquillity Schools, Colonial Hospital, Fire Brigade and Constabulary Station, Woodbrook, Eastern Boys' and Girls' School and the House of Refuge.

GOVERNMENT STOCK FARM.

78. A detailed account of the work undertaken at the Farm during the year will be found in the report of the Officer-in-Charge, Captain H. V. M. Metivier, O.B.E., which is printed in Part II of this report.

79. Early in the year the Animal Husbandry Committee of the Agricultural Society submitted a report to Government in which recommendations were made for the development of the livestock industry of the Colony. In conformity with the policy recommended a system of itinerant breeding units was put into operation. Two such units were used during 1937 each consisting of a Jack Donkey, Holstein Bull, British Alpine Buck Goat and, when required, a Boar and Stallion. These were stationed at eight centres, operating in each area for a period of two months. The number of units to be put on the road will be augmented during 1938 and the period during which each unit remains in any district will be increased from two to three months. In addition to the itinerant units a number of stud animals were stationed in various districts, under the care of private individuals, for use by local stock owners.

80. The number of stud animals and breeding stock at the Tobago Farm was increased during the year by the transfer from Trinidad of three bulls, five goats, two pigs and one sheep.

81. The Murrah Water Buffaloes imported from India reached the Colony early in January. The consignment consisted of eight bulls and seven cows ; two of each sex, specially selected for their high milking qualities, were imported for the Farm ; the balance were obtained on behalf of certain Sugar Estates to whom they were handed over. The importation should prove to be of considerable value in improving the standard of water buffaloes in the Colony—particularly the yield of milk.

82. The four herds of Zebu cattle have been maintained, and young stock of the milking Zebu herd have responded well to the form of management commenced in 1936.

83. Work on the production and improvement of Zebu-Holstein grades has been continued on similar lines as in previous years, and the small herd of pure bred and grade Sussex has been maintained primarily to supply breeding stock of this beef type to Tobago.

84. There was a drop in the milk yield of the dairy herd which produced 33,898 gallons as compared with 40,520 gallons in 1936. The revenue from the sale of milk amounted to $16,140.00.

85. There were no cases of paralytic rabies on the Farm and no cases of anthrax. All cattle were tuberculin tested three times during the year ; six animals which reacted were destroyed.

86. The stallion " Young Native ", imported in 1936, had his first season but results were disappointing and mares served by him failed to hold. The Stallion " Restigouche ", owned by Mr. George de Nobriga, stood at the Farm for four months.

87. During the year seven pure bred buck goats were imported, six being of the British Alpine breed, these will supplement the existing stock and will be used in the itinerant breeding units referred to above. The pure bred British Alpine has been proved to be eminently suited to local conditions, and all grade does and goatlings have been sold, only pure bred stock being kept at the Farm for breeding purposes.

88. At the Annual Sale of stock held in December there was a very good attendance and keen bidding for the lots offered. The amount realised was $3,159.00 approximately the same as in 1936. Private sales of stock during the year amounted to $2,225.00 making a total of $5,384.00 for the year. Expenditure during the year amounted to $32,581.00 and revenue to $30.034.00.

SUGAR CANE INVESTIGATION COMMITTEE.

89. The work of the Sugar-Cane Agronomist included in the main field experiments (manurial, cultural and varietal trials), biochemical investigations and soil studies. Details will be found in Mr. Turner's report in Part II. The results of the work are leading to modifications in current estate practice.

90. Some 60 manurial experiments were harvested during the course of the year. They were concerned primarily with optimum size and time of application of dressings of ground limestone, nitrogen, phosphate, potash and pen manure, alone and in various combinations.

91. The cultural experiments embraced such diverse problems as methods of preparatory cultivation, methods of planting, depth of drains, mulching, and tillage of ratoons.

92. The Sugar-cane Agronomist has recently taken charge of variety trials. A thorough comparison is being made of the Variety B.726 with the varieties at present standard in the Island and preliminary comparisons are under way of the varieties recently introduced from Barbados and elsewhere.

93. The biochemical investigations have been concerned with the use of manures in a manner such as to improve juice quality, and with the diagnosis of nutrient deficiencies by means of leaf analysis. Both lines of work have met with a considerable degree of success.

94. As a result of soil analyses, coupled with data from the field experiments, it is now possible to place the manuring of sugar-cane with potash as well as lime on a surer scientific basis than formerly. Definite recommendations can be made with regard to the size of dressing of these manures for individual fields. It is satisfactory to report that the field-to-field survey of lime requirement and potash deficiency, mentioned in the Annual Reports for 1935 and 1936, has been extended to two more estates.

95. Mr. A. Pickles, Entomologist, has continued his work on sugar-cane pests, of which details are given in the second part of this report.

96. Attacks of the sugar-cane froghopper were less severe than in 1936, but about 1,000 acres of cane were severely blighted ; recovery in general was, however, good.

97. Further experiments with pyrethrum dust have shown that a high mortality of adult froghoppers can be obtained by the use of this material. With the aid of a grant from the Colonial Development Fund, a power duster is to be obtained whereby this method can be tested on a field scale.

98. The work of the Sugar-Cane Agronomist is carried out under the auspices of the Sugar-Cane Investigation Committee which is financed by Government and the Sugar-Manufacturers' Association.

FERTILISER EXPERIMENTS.

99. Fertiliser experiments have now assumed proportions that make these investigations an important branch of the work of the Department. The valuable results of the fertiliser work with sugar-cane is reported upon by the Sugar Agronomist, Mr. P. E. Turner. Fertiliser trials with cocoa comprise extensive tests with funds provided by the Cocoa Subsidy Board, as well as a series of plots at River Estate, and are reported upon by the Agronomist. Citrus experiments include the 30-acre block at the St. Augustine Station and trials on private estates.

100. The striking crop increases obtained, from time to time, indicate the value of the work ; the apparent inconsistencies, recorded at other times, indicate the difficulties and emphasize the need for continued research of this nature.

WITCHBROOM DISEASE OF COCOA.

101. An account of the present position of this disease will be found in the report of the Plant Pathologist, and the work undertaken at Marper Estate on control measures is outlined in the report of the Agronomist.

102. The comparatively dry conditions experienced during the year resulted in many areas, in a decrease in the number of brooms produced, and it is to be regretted that there was no corresponding reduction in the amount of pod infection. Stimulated by the grant of the assistance afforded by the Cocoa Subsidy Scheme, and by the increase in the price of cocoa, planters, during the early part of the year, undertook a certain amount of control of the disease by the removal of brooms. Unfortunately in May cocoa prices again returned to a low level with consequent reduction in the amount of control work which estates were able to perform.

103. As an indication of crop losses sustained on account of witchbroom in the most highly affected areas it may be mentioned that detailed records kept on 11 properties during the 1936-37 season showed an average loss of crop of 37.5 per cent., the range being from 22.5 per cent. to 51 per cent. At Marper Estate, where regular control measures are practised, crop losses during the same period amounted to less than 9 per cent.

104. The Agricultural Officer, Sangre Grande, initiated experiments to ascertain whether pod infection could be reduced by spraying with Bordeaux mixture at critical periods during the fruiting season. It is obvious that, should it be possible to reduce pod infection to a minimum by this means at a reasonable cost, vegetative infection becomes relatively less serious. The first year's results are interesting and may be summarised as follows :—

Estate	*Acreage treated.*	*Spray treatments.*	*Percentage pod infection.*
A	4	August, November	7.1
	4	August	14.5
	4	Control	30.1
B	1	August, September, October	8.1
	1	do. do.	6.1
	1	do. do.	9.2
	1	August, November	8.9
	1	do.	14.3
	1	do.	10.6
	1	Control	25.8
	1	do.	35.0
	1	do.	21.0
C	1	September, October, November	12.0
	1	do. do.	15.0
	1	do. do.	10.7
	1	September, November	16.2
	1	do. do.	18.3
	1	do. do.	14.6
	1	Control	31.7
	1	do.	24.1
	1	do.	34.5

105. The results given in the foregoing table represent two or three pickings over a recognised peak period for diseased pods, and indicate that a fair measure of control can be obtained. Whether such spraying of pods is economic depends on the market price of cocoa. Further trials will be undertaken in 1938. On a fourth estate where a similar experiment was conducted results were disappointing.

106. The Agronomist visited Ecuador during the period 24th April to 7th August to study the progress made since 1933 in that country in the selection of witchbroom resistant cocoa and to collect, if possible, planting material of such types and also of wild types *Theobroma* suitable for breeding purposes with a view to developing resistant strains.

107. Dr. Pound was satisfied that there exist in Ecuador trees showing a high degree of resistance and he succeeded in obtaining three hundred pods from some 80 of the trees which, of those inspected, showed the least incidence of witchbroom under Ecuador conditions.

108. To avoid any risk of introducing Monilia disease into Trinidad, the seed when received was forwarded to Barbados where the plants are being grown in quarantine. Satisfactory growth has, in most cases, been obtained ; some 5,000 seedlings have been raised ; and budwood should be available for transfer to Trinidad early in 1938. Thanks are due to the Department of Agriculture, Barbados, for their co-operation in this matter and for the care and attention they have given to the plants.

109. Early in November, Dr. Pound with a companion, Mr. P. L. Amundarain, left for South America on a second expedition with the same object as the first. On this occasion the party proceeded up the Amazon, making their headquarters at Iquitos and from that centre exploring in territory belonging to Peru, Colombia, Brazil and Ecuador. At the time of writing this report, five consignments of planting material have been received and have been forwarded to Barbados.

ANIMAL DISEASES.

Anthrax.

110. Three cases occurred on the Government Farm, Tobago. The necessary preventive measures were enforced and there was no extension of the outbreak. No cases occurred in Trinidad.

Tuberculosis.

111. Tuberculin testing of dairy cattle is now compulsory for those dairies serving Port-of-Spain. Over nine hundred dairy cows in 377 cowsheds were tested, three reactors were found and destroyed and their owners compensated.

Paralytic Rabies.

112. The incidence of this disease during 1937 was considerably less than in the previous year. 57 cases were recorded as compared with 217 cases in 1936 and 331 cases in 1935. The majority of the deaths occurred in the Northern area. As in former years control measures consisted of vaccination of livestock and the destruction of bats by shooting, trapping, poisoning, &c., the latter work being undertaken by the Medical Department. Over 4,000 animals were vaccinated during the year, and no cases of the disease occurred in protected animals.

113. The work of bat destruction, undertaken by the Medical Department, resulted in the capture of large numbers of which 3,377 were examined by the Government Bacteriologist and negri bodies found in 143 Desmodus bats.

Swine Fever.

114. No cases occurred. Veterinary certificates were required in the case of all chilled pork and hams imported from the Argentine and Brazil.

Rabies.

115. Fifty-four dogs were quarantined on their arrival in the Colony. No cases of the disease occurred.

DISTRICT AGRICULTURAL WORK.

116. The Deputy Director has been responsible for the organization and general supervision of the district work and staff and the following report has been prepared by him.

117. The numbers and organization of the district staff remained as in 1936 at two agricultural officers, 11 agricultural advisers and 23 inspectors of the Plant Protection Service. As in 1936 a great deal of the time of the district staff has been devoted to work in connection with the Cocoa Subsidy Scheme, plant protection inspectors being engaged for practically the whole of their time and the majority of the advisers giving three days a week to this work.

118. One of the Agricultural Advisers retired on pension during the year and a second proceeded on long leave to Canada. Two acting appointments were made to fill the vacancies, the men selected being past students of the Imperial College of Tropical Agriculture where they had obtained the College diploma. The vacancy for a third agricultural officer was not filled during the year; the appointment of this officer was deferred pending a reorganization of the district staff, proposals for which were discussed by the Director, while on leave, with the Agricultural Adviser to the Secretary of State.

119. Mr. B. G. Montserin, Agricultural Officer, has devoted a considerable amount of time to work on cocoa and has obtained some interesting results on the possibility of reducing loss of crop through witchbroom by spraying pods at critical periods. A summary of his experiments will be found in the section of this report dealing with witchbroom. Mr. F. M. Bain, Agricultural Officer, in addition to normal district duties, has specialised on citrus and, with the co-operation of the owners of Macqueripe Estates, has continued his irrigation studies on grapefruit.

Peasant Proprietors' Cocoa Holdings.

120. The grant of cocoa subsidy to small proprietors is conditional on the cultivation of the property being maintained, by the proprietor, in fair order; the owner of the estate must also make a reasonable effort to control witchbroom disease and he must endeavour to produce as large a quantity of food crops as possible for consumption by himself and his family. The frequent inspection visits which advisers and inspectors made to the large number of small cocoa properties in connection with the subsidy work has enabled them to make much closer contact with peasant proprietors than would be the case with normal district work; and the conditions governing the grant of the subsidy have ensured that the advice and instruction given were not lightly disregarded—for the payment of the subsidy grant was dependent on the receipt, by the Subsidy Board, of satisfactory reports on the condition of the estate.

121. Apart from their subsidy duties agricultural advisers have undertaken the inspection of properties mortgaged to the Agricultural Bank, the preliminary judging of school gardens for the annual competition, valuations for the Public Works Department to assess compensation payable in respect of cultivation taken over for road construction purposes and the majority of them have been engaged on work connected with banana shipments which are made fortnightly under contract with the Canadian Banana Company.

Rice—Irrigation.

Oropuche Lagoon.

122. Unfavourable weather was experienced during the rice season, rainfall being inadequate during transplanting and in the early stages of growth, while heavy showers caused difficulty in harvesting and drying of the paddy. These unfavourable conditions caused a reduction in the area under rice and it is estimated that only approximately 1,500 acres were planted which gave an average yield of 15 barrels (160 lb.) of paddy per acre. At current prices this represented a gross return to the grower of £8 6s. 8d. per acre.

Caroni-Chaguanas area.

123. Owing to abnormally dry conditions which prevailed in the Caroni-Chaguanas area during the rice planting season, it was found necessary to institute temporary irrigation measures to supply water to the rice fields.

124. The areas in question were the rice lands to the north and south of the Cunupia River lying to the east and west of the Caroni Savannah Road and including the Cacandee Settlement.

125. Use was made of the water in the Cunupia and Caparo rivers by the building of temporary dams in these rivers and by pumping water from the Cunupia. As a result of the work undertaken some 2,000 acres were supplied with irrigation water and growers in the area were able to plant and harvest a rice crop which, but for the water supplied, would have been almost a total failure. It should be mentioned that not all the available rice lands supplied with irrigation water could be planted; owing to the prolonged drought many nurseries failed and a sufficient number of seedlings were unobtainable when water became available. It is estimated that approximately 1,800 acres were ultimately planted which yielded 13 barrels per acre.

126. The work was undertaken and completed at a cost of some £312 10s. It would not have been possible to carry out the work as quickly as was necessary, nor at such a low cost, had it not been for the wholehearted co-operation of Caroni Estates Ltd., who assisted by the loan of a portable pump and by the provision of labour where required, and for the assistance afforded by Woodford Lodge Estates, Mr. J. A. de Verteuil, and Mr. A. V. Stollmeyer, through whose lands it became necessary to lead the irrigation water.

127. The failure of the rains in this area for the second time in four years—it was necessary to undertake emergency irrigation measures in 1934—brought to a head the question of the necessity for the institution of permanent irrigation works to serve rice growers in these areas. On the completion of the emergency measures a scheme was prepared and submitted to Government for the provision of permanent irrigation; the basis of the scheme is the installation of sluice gates in the Cunupia and Caparo rivers and use of the head of water so obtained to irrigate the rice lands. The scheme was approved in principle and provision has been made in the 1938 budget for the estimated cost of the work.

Land Settlement Scheme.

128. At the end of the year there were 29 settlements established in Trinidad and one in Tobago comprising approximately 1,911 acres made up of 1,604 allotments. Of this number 1,205 allotments were occupied, 722 had been purchased and 483 were held under agreement with an option to purchase. The majority of the remaining allotments are in surveyed settlements but to which roads of access have not yet been provided.

129. The majority of the settlements are devoted to the growing of food crops for home consumption. The existing settlements are not designed to render the holders self-supporting, but are intended to provide the allotment holder with land on which he can build his house, augment his income, and add variety to his diet from the crops grown on his holding.

130. The Buenos Ayres and La Pas settlements in Toco, which were formerly cocoa estates, have now completed their first year. The development of these is of particular interest in that they are the only settlements on which a permanent crop—cocoa—is established and on no other settlement is there an agricultural adviser in residence. The allotment holders have made satisfactory progress and already 12 settlers have paid for their holdings in full and 14 of them have their houses built or in course of construction on their allotments. The satisfactory progress which has been made is largely due to the enthusiasm and intensive supervision given by the resident adviser, Mr. S. E. Hagley.

131. From an agricultural point of view the other settlements as a whole have suffered from lack of adequate supervision and, though as much attention has been given to them as has been possible, the multifarious duties which the members of the district staff are called upon to perform and, in particular, the three days a week which each adviser has to devote to work in connection with the Cocoa Subsidy Scheme, have made it impossible for Advisers to give the close supervision that is is essential.

132. Towards the end of the year a Committee was appointed by Government, under the chairmanship of the Director of Agriculture, to consider and report upon the question of land settlement. At the end of the year the Committee had not submitted its report, but any proposals for the extension of land settlements must entail the provision of an adequate supervisory staff.

Bananas.

133. Selection of the fruit at the Wharf was undertaken, as in former years, by the Banana Officer of this Department. The percentage of fruit rejected amounted to 6.3 per cent., compared with a similar percentage in 1936 and 11.9 per cent. in 1935. One-third of the fruit rejected was for incorrect grade, one-third on account of bruising, the balance being mainly scarred fruit. Roadside rejects by collectors, who purchase fruit direct from the smaller growers in the various districts on behalf of the Banana Board amounted to approximately nine per cent. of the fruit offered for sale.

134. Of the district staff four of the advisers and 26 of the Plant Protection Officers under the supervision of Mr. J. R. Foster and the Banana Officer have been engaged on banana work. They have been responsible, not only for undertaking the purchasing of the fruit from the smaller growers, but have had to maintain close touch with them in an endeavour to induce such growers to maintain their production and to market a grade of fruit which would be accepted for shipment.

135. Cercospora disease continued to increase in intensity and in a number of areas proved to be the limiting factor in the production of this crop; a number of planters have abandoned cultivation for export on account of the ravages of this disease. Experiments, on a small scale, were undertaken to determine whether spraying with Bordeaux Mixture gave economic control but no definite conclusions were obtained.

136. A census taken at the close of the year by the Banana Officer of the numbers of I.C. 2 bananas planted in the Colony showed that some 2,700 stools were established on 23 estates. This banana, which was bred at the Imperial College of Tropical Agriculture, is immune to Panama disease and is highly resistant to Cercospora leaf spot and, while it is not as acceptable to the trade as the Gros Michel, it is potentially of great value owing to the rapid increase of Cercospora disease in the banana growing countries of the Western Hemisphere.

Home Grown Foods.

137. There is little that can be added to what has been written in previous reports of the Department regarding the importation of foods from abroad and the need for a greater effort being made to produce in home gardens a larger proportion of the food requirements of the colony.

138. Below is a list of the cost of the more important foods imported in 1936 and 1937 and it will be noted that importations of flour alone cost over £400,000, although the quantity imported was smaller than in 1936.

	1936	1937
	£	£
Flour	339,756	433,788
Rice	180,092	186,320
Condensed Milk	115,819	120,759
Meat	171,250	199,258
Vegetables (Onions, Irish Potatoes, &c.)...	65,123	65,864
Beans and Pulses	29,012	38,318
Total	901,052	1,044,307

The bill is a heavy one for a tropical colony with a population of under 500,000 persons. Apart from the financial aspect, the important question of nutrition and health must be kept well in mind. Fresh vegetables and fruits, milk, eggs, meat and brown rice are all authoritatively recommended as protective foods of which ample quantities should be consumed.

139. Active propaganda has been conducted to encourage greater dependence on local grown foods; advice has been given by the District staff; special competitions have been held in three districts; and one class of land settlement is for the purpose of food production alone. In view of the continued efforts to popularize the cultivation of home gardens, the tables given above are disappointing.

Plant Protection Service.

Witchbroom.

140. Plant Protection Officers submitted regular reports on the incidence of Witchbroom disease on properties visited by them in connection with their cocoa subsidy duties and, during the course of such visits, impressed on proprietors the necessity for cutting out and destruction of brooms and the fact that a reasonable effort to control this disease was a condition governing the grant of subsidy.

141. During the year trials were undertaken to ascertain the efficacy of burning brooms on the trees, as opposed to removal by cutting and subsequent burning, as a method of control of witchbroom. It was found that in practice it was difficult to obtain an effective burning of the brooms, even with the use of a blowlamp, that the method was comparatively expensive, and that mushrooms were frequently found in the "burnt" brooms. It is considered that this method of control cannot be recommended particularly as, in ordinary estate practice, removal of brooms forms part of the normal routine of pruning.

142. During the year 38 cocoa trees, which had showed in past years resistance to witchbroom were kept under observation by the district inspection staff. These trees were selected from 215,000 trees originally examined in the worst affected districts. Of the 38 trees recorded 12 had no brooms during the year and 18 had less than ten brooms.

143. Budwood and seed were collected from 17 of these highly resistant trees; the seeds and budded plants have been planted in testing nurseries situated in the Manzanilla district. The nurseries at the end of the year, contained a total of 946 plants of which 590 plants remain uninfected to date. In addition, over 1,000 seeds from the resistant trees were sown in boxes and will be planted out in 1938 in the testing grounds at Marper Estate.

Sugar Cane Mosaic.

144. The three inspectors engaged on work in connection with the control of mosaic disease of sugar cane visited 1,742 farmers representing an area of 4,405 acres. 462 farms were found to be infected in a minor degree, 3,130 stools were dug out and destroyed. The number of diseased stools found was somewhat less than in 1936.

Cocoa Vermin.

145. The campaign against cocoa rats initiated in 1936 when the use of "sulphur matches" with bananas as a bait was extensively advocated was continued during the year. The successful results obtained by planters at the beginning of the campaign led to an increased demand for these matches during 1937 and supplies were given, free of charge, to numerous applicants in Trinidad and Tobago. During the year a bulletin on "The Tree Rat as a pest of Cocoa in Trinidad" by Mr. B. G. Montserin, Agricultural Officer, was published detailing the life history of the cocoa rat, the results of experiments with various types of poison bait and giving instructions for baiting with "Sulphur Matches". There was a considerable demand for these matches from Grenada.

Cocoa Thrips.

146. Losses due to thrips attacks were relatively slight during the year, the attacks being confined to small areas in widely separated localities. Experiments by the Entomologist indicate that a mortality of 90 per cent. of the insects may be obtained by dusting the affected trees with hydrated lime. It is believed that a practical field method on these lines may be developed.

Black Bees.

146A. Black Bees, a destructive pest of citrus, were not as active as in former years, only 18 nests were reported and destroyed.

Panama Disease.

146B. Panama disease of bananas is on the increase and too little attention is given, by planters, to the treatment of this disease, though supplies of banana killer oil are available, free of charge, to all planters having less than 50 acres of land. 9,4 stools of Gros Michel bananas were treated with Banana Disease Killer Oil by Plant Protection Inspectors.

Agricultural Credit and Co-operative Societies.

Credit Societies.

147. No new Societies were registered during the year, the total number in operation remaining at 52 of which there are 39 in Trinidad and 13 in Tobago.

Trinidad.

148. Twenty of the 39 societies in Trinidad are operated under the supervision of the Ste. Madeleine Sugar Company and financed by that Company. Of the 19 societies run by the Department, new loans amounting to £3,129 were granted to 14 societies and, with few exceptions, societies met their obligations satisfactorily. The total amount owing to Government at the close of the financial year, 30th June, 1937, was £4,375 of which £3,081 was paid leaving a balance of £1,294.

Ste. Madeleine Societies.

149. Of the 800 members of these societies, 670 received advances amounting to £11,342. The total sum advanced was repaid during the year.

Tobago.

150. No new loans were made to Tobago societies during the year. At the 1st July, 1936, there was a balance owing to Government of £1,568, interest to 30th June, 1937, amounting to £79. Repayments by Societies had been unsatisfactory in the past and during 1937 a special effort was made to induce the Societies to collect amounts due from members and, in turn, to make repayment to Government. The results obtained were satisfactory, £818 was repaid to Government leaving a balance of £830 still in arrear.

Co-operative Societies.

Tobago Producers' Co-operative Association Ltd.

151. This Association completed its fourth year of operation. During the year its affairs were found to be in a very unsatisfactory condition and the Treasurer, at the request of the Registrar, undertook towards the end of the year an investigation into the working of the Association and its financial position.

Tobago Lime Growers' Co-operative Association Ltd.

152. The Lime Factory had a successful year, the quantity of limes handled being 8,567 barrels as compared with 4,080 barrels in 1936. The lime oil produced by the Association was sold through the Lime Oil Producers' Association of Trinidad and Tobago of which the Tobago Association is a member.

Tobago Co-operative Cocoa Fermentaries.

153. The five co-perative cocoa fermentaries in Tobago continued operations during the year. The total amount of cocoa handled amounted to 1,567 fanegas (110 lb.) which was slightly less than the quantity purchased in 1936. The position of the two fermentaries, at Roxborough and Pembroke, is satisfactory, but those at Parlatuvier, Delaford and that at Scarborough managed by the Tobago Producers' Association are not making satisfactory progress.

Co-operative Citrus Growers' Association Ltd.

154. This Association handles the whole of the export citrus crop and details of the quantities which passed through the central packing house of the Association during the past season will be found in the citrus section of this report.

155. The most noteworthy development of the past year has been the increase in the canning side of the Association's activities; during the 1936-37 season 600,000 tins of grapefruit hearts and juice were produced. A ready market was found for these canned products which were very favourably reported on by the trade; the majority of the juice was shipped to Canada, while both juice and hearts were marketed in England, New Zealand and in West Indian Islands. The extension of canning activities is an important development for it affords a market for low grade, cull and seeded fruit for which the grower, in former years, received little or no return.

156. During the year the Association had under consideration proposals for the enlargement of both the packing unit and the canning plant; considerable extensions will be necessary in the near future to enable the Association to deal with the increased crops which are being harvested annually as the newer orchards come into bearing and established plantings attain full maturity.

Coconut Growers' Association Ltd.

157. This Association has entered upon its second year of operation and, during the year, handled nearly 2½ million nuts and 5,338 tons of copra. The erection of a factory for the manufacture of edible oil was begun and it is expected that production will commence early in 1938.

Bee and Poultry Co-operative Association Ltd.

158. The Association which was registered in November, 1935, discontinued operations in May, 1937, when by resolution of a general meeting of members it was decided to terminate business. The Registrar of Co-operative Societies appointed a liquidator to wind up the affairs of the Association. The principal cause leading to the cessation of operations was the failure of members to abide by the rules of the Association, which required all produce to be marketed through the Association, and it is to be regretted that liquidation was found to be necessary for the Association could have done much to develop these important minor industries.

Government Fermentaries.

159. The two Government controlled fermentaries, one of which is at Biche in the Sangre Grande district, and the other at Penal in the Siparia district, continued operations during the year.

160. The Biche fermentary handled 111,248 lb. of wet cocoa yielding 41,552 lb. dry or 377.8 fanegas during the crop season ending 30th June, 1937, as compared with 129,885 lb. wet cocoa yielding 49, 210 lb. dry or 447.4 fanegas for the preceding season ; the number of peasant proprietors and contractors delivering cocoa being 130 during the 1936-37 season as against 126 for the previous season.

161. The Penal fermentary handled 32,757 lb. wet cocoa yielding 12,210 lb. dry or 111 fanegas for the 1936-37 season as compared with 28,726 lb. wet cocoa yielding 10,972 lb. dry or 99.7 fanegas for the preceding season. Only 22 peasants delivered cocoa during the 1936-37 season.

162. The cocoa from both fermentaries were sold through the Cocoa Planters' Association, thus enabling the peasants to obtain the C.P.A. plantation market value for their cocoa.

COMMITTEE WORK.

163. The Director and the Deputy Director have had to devote much time to Committee work, and one or other of these officers is member, or Chairman, of the following Committees :—Board of Agriculture ; Committee of Management of the Agricultural Society, and the Livestock, Cocoa and Exhibition Sub-Committees of the Society ; Agricultural Bank ; Cocoa Subsidy Board ; Hurricane Relief and Cocoa Industry Relief Committees; Sugar Cane Investigation Committee; Banana Board ; Plant Quarantine Committee ; Board of Management of the Ground Provision Depot ; Land Advisory Committee ; Nutrition Committee ; Board of Management of the Co-operative Citrus Growers' Association ; Land Settlement Committee ; and Civil Service Staff Board.

IMPERIAL COLLEGE OF TROPICAL AGRICULTURE.

164. The Department of Agriculture has again to acknowledge the co-operation and assistance of the Imperial College of Tropical Agriculture. To Sir Geoffrey Evans, Principal, and the members of his staff we are indebted for practical help and advice in many matters relating to the agriculture of the colony. Professor Hardy has assisted in determining the fertilisers to be tested on cocoa soils ; and has undertaken important citrus studies ; Professor Cheesman and Professor Shephard have both given advice relating to other phases of cocoa work ; Mr. Baker has carried out an important study of citrus scab ; and Dr. Wardlaw has been responsible for special cold storage investigations bearing on the citrus and banana industries.

PUBLICATIONS.

165. The following publications, or contributions to literature, by officers of the Department, were issued during the year :—

" Report of Dr. F. J. Pound, Agronomist, on his visit to Ecuador to study the progress made in selection of Witchbroom Resistant Cacao Trees since 1933 and to collect wild types of Theobroma from the districts visited ".— Council Paper No. 115 of 1937.

" Guide to the Royal Botanic Gardens " (Revised Edition)—R. E. Dean.

" Bronze Leaf Wilt Disease of the Coconut Palm ".—F. M. Bain, B.S.A.

" The Tree Rat as a Pest of Cacao in Trinidad ".—B. G. Montserin, M.Sc.

" The Solar Fermentary for Curing Small Quantities of Cacao ".—Dr. F. J. Pound.

" Field Experiments on Sugar Cane in Trinidad " Annual Report for 1937.—P. E. Turner, M.Sc.

" Recent Investigations on Sugar Cane and Sugar Cane Soils in Trinidad III. Effects of Manurial Treatment with Ground Limestone on crop quality and yield of commercial Sugar (concluded)." *Tropical Agriculture*, Vol. XIV, No. 3 pp. 63-69.—P. E. Turner, M.Sc.

AGRICULTURAL LEGISLATION.

166. The following Ordinances and Regulations affecting agricultural industries came into force during the year :—

The Sugar Quotas Ordinance, 1937.

The Cane Farming Control Ordinance, 1937.

The Plant Protection Regulations 1937 controlling the movement of plants from Trinidad to Tobago.

The Exportation of Fruit (Budded Oranges and Grapefruit) Regulations 1937 revising regulations made in 1931.

III.—REVENUE AND EXPENDITURE.

167. Annexure "A" contains a detailed statement of the accounts of the Department for the year 1937. The total expenditure amounted to £50,906 18s. 6d. and was £5,958 4s. 0d. more than in the previous year. The total revenue was £17,588 1s. 3d. and was £1,750 10s. 7d. more than in 1936. The Stock Farm brought in £6,735 13s. 9d., River Estate £5,341 17s. 0d., the St. Augustine Nursery and Experimental Station £2,548 7s. 3d. and Veterinary Fees £1,864 2s. 1d.

168. The work under the Plant Protection Ordinance was responsible for the sum of £4,316 12s. 8d. Upkeep of the Royal Botanic Gardens, the Queen's Park Savannah and other Government Grounds cost £5,545 12s. 10d., and £1,185 was a contribution to the work of the Sugar Cane Investigation Committee.

IV.—STAFF.

169. New appointments made during the year were Mr. P. S. Castagne and Mr. Oliver Rampersad, 3rd Class Clerks.

170. Officers on vacation leave during the year were :—Mr. E. J. Wortley, Director of Agriculture ; Mr. P. E. Turner, Sugar Agronomist ; Dr. M. D. Lumsden, Veterinary Officer ; Mr. F. C. Buthn, Manager, St. Augustine Nursery ; Mr. J. H. Brooks, 2nd Class Clerk, Government Farm ; Miss C. M. Seheult and Miss Evelyn de Verteuil, 3rd Class Clerks.

171. Miss Evelyn de Verteuil, 3rd Class Clerk, who served this Department well for nine and a half years resigned from the Government service on the 30th November, 1937.

172. I desire to acknowledge my indebtedness to the members of the staff for their keen interest in, and their close application to, their duties.

E. J. WORTLEY,
Director of Agriculture.

26th April, 1938.

PART II.

DIVISIONAL REPORTS.

	Page.
Report of Agronomist	20
River Estate	32
St. Augustine Nursery	42
St. Augustine Experiment Station	44
Report of Curator, Royal Botanic Gardens	49
Government Stock Farm, Trinidad	51
Report of Veterinary Division	60
Report of Plant Pathologist	65
Report of Entomologist	71
Report of Sugar-Cane Agronomist	72
Wilt Disease of Coconuts	75
Citrus Studies	76

REPORT OF AGRONOMIST FOR 1937.

The Annual Report for 1937 deals with :—

A.—River Estate.
B.—Marper Estate.
C.—Cocoa Manurial Experiments.
D.—Tonka Bean Experiments.
E.—Coconut Manurial Experiments
F.—Grenada Cocoa Experiments.
G.—Visit to Ecuador.
H.—Miscellaneous Crops.

A.—RIVER ESTATE.

General.

2. The policy outlined in the previous report (1936) has been carried further than was anticipated and the majority of areas considered unsuitable for cocoa have already been partially interplanted with other crops, chief of which are coffee, tonka beans and limes. In 1938 a clean start will be made with a revision of boundaries and re-checking of areas and pickets of the altered fields. Thus from 1938 the estate will consist of :—

(1) Pure Cocoa.
(2) Interplanted Cocoa.
(3) Limes.
(4) Grapefruit and oranges.
(5) Tonka Beans.
(6) Timber.
(7) Minor crops—coffee, &c.
(8) Uncultivated land

3. Up to the present the cost accounting system for Cocoa has included both pure and interplanted areas and the interplanted areas being poor for cocoa have considerably reduced the average crop in addition to increasing the cost of production.

(1) Pure Cocoa.

4. The pure cocoa area will approximate to 330 acres on which fertiliser and other trials are in progress. As finances allow this area will be replanted with selected material. Already 12 acres were replanted in 1932. During 1936 a small field of 4 acres was replanted with stocks on which self compatible and self incompatible buds will be worked in order to test the distance which pollen can be transferred from self compatible to self incompatible trees. Also during 1936 about an acre was planted with grafted criollo plants and the Professor of Botany of the Imperial College of Tropical Agriculture has planted the first section of a proposed experiment to compare clonal material of certain selected heavy yieldings varieties.

5. The studies of pollen compatibility at present being made by the Botanical Department of the Imperial College in great detail at River Estate have shown that the inability of many trees to bear large crops is due to the ineffectiveness of self pollen. Large scale tests show that there may be less than 25 per cent. of trees capable of setting with self pollen and this not only plays a large role in determining yields but adds a hitherto unrealized complication to manurial and cultural experiments and may explain a good deal of the erratic results of the former.

6. Self compatible trees *always* have a crop when other trees do, and *generally* have a crop when other trees have none. Self incompatible trees *may* have a crop when other trees do, but rarely have a crop when other trees have none. It is well known that some self incompatible trees are heavy yielders but our cocoa fields would be well rid of all of them.

7. It follows that the proportion of self incompatible trees in a manurial experiment may seriously influence the results and such field operations as pruning and draining on a large percentage of self incompatible trees may give very poor returns.

8. The future of cocoa in Trinidad seems to lie in the replanting of areas with high yielding and high quality budded self compatible trees—resistant to witchbroom if possible—and the quicker experiments can be started on blocks of this nature the better shall we be prepared for the future rehabilitation programmes. Thus on the Government Estate, the planting of uniform blocks of this material will be pushed ahead to receive experiments.

9. The results of manurial experiments being conducted at River Estate are given in the Manurial Experiments section of this report.

(2) Interplanted Cocoa.

10. From 1938 onwards these areas are being accounted separately from the pure cocoa areas. The objects are to determine exactly what it costs to replace cocoa with some other crop by this method and also to give returns for a permanent mixture of two crops on the same area. Thus for the first object all the cocoa reaped is credited to the field in question to discount the capital debt accumulating against the new crop. For the second object there is the possibility to be explored of growing say cocoa, coffee, and Tonka Beans, all in the same field. Where coffee was interplanted with cocoa in a very poor field at River Estate and all the very bad cocoa trees removed the combined crops are doing very well and the losses which would have been sustained from cocoa alone have been almost wiped out.

(3) Limes.

11. The lime area has been considerably extended during recent years by the Contractor system and some of these new areas are being taken over by the estate. Instead of accounting for all expenditure on limes as one item, now there are several fields, each is being accounted separately

12. On the small block of T1 limes a fertiliser experiment has been laid down to give information on growth, cropping and juice content.

(4) Grapefruit and Oranges.

13. Field 20C has been cleared of cocoa and planted with grapefruit as a " replacement" experiment. This field will become the site of a fertiliser experiment in 1939.

(5) Tonka Beans.

14. The manures applied to the bearing trees have not produced any response as yield increase.

15. The 7×7 Latin square N.P.K. experiment on young trees was commenced and progress has been made in establishing layered plants of 6 dwarf and 6 heavy bearing trees as a variety trial. Extensive areas have been recently planted with tonka beans and it is planned that further experiments will be laid down on them.

(6) Timber.

16. No precise experiments are being conducted on timber. The Manager's report deals with this section.

(7) Minor Crops.

17. A coffee progeny trial of specially selected Robusta varieties has been planted. Papaws have been interplanted over the whole area partly as ground shade and partly to test the possibility of growing blocks of papaws for papain extraction.

18. A small Derris trial has been put down and other minor crops are being grown for multiplication.

Cultural Experiments on Cocoa at River Estate.

Distance Spacing Experiments.

19. The details of these experiments have been presented in earlier reports and do not need repetition here.

20. Statistics of yields to August 31st, 1937, are given below :—

Spacing Experiments :

	Spacing Average 1st 12 years.	*Yield 12th Crop.* 1937.	1929.
	lb.	lb.	lb.
6×6	367	531	
8×8	335	541	
* 10×10	188	392	
12×12	379	—	628
14×14	362	—	566
16×16	298	—	632
18×18	270	—	610

*Happened to strike a poor soil pocket.

	Average 20 years.	*Yield 20th Crop.* 1937.
	lb.	lb.
12×12	458	558
14×14	471	686
16×16	419	624
18×18	403	624

21. There are probably no significant differences between these yields.

Seedlings from Heavy Bearing Tree No. 4927.

22. The average yield for this tree during the four years 1913-16 was 332 pods per annum, roughly equivalent to half a ton of cocoa per acre per annum since it occupied a space of 30×30 ft., and gave pods valued at 16 to the pound. In 1917 a plot of 178 stakes was planted with seed from this tree. The yield of the progeny since 1927 is given below :—

YIELD OF PROGENY TREE NO. 4927 (lb. per acre).

1927.	1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.
637	18	816	710	634	821	748	745	963	638	786

Thus the progeny although only just mature have given yields well above normal for the estate (approximately 450 lb. per acre).

Propagation Experiment.

23. The object of this experiment is to test the comparative merits of seedlings, budded, and grafted trees of the same parent under estate conditions. Full particulars of the experiments and earlier yields have been given in preceding reports.

24. The results to date are given below :—

Bags per Acre. 1937.		*Lb. Dry Cocoa per Acre per Annum.* 1918-37.	1934.	1935.	1936.	1937.
	1. *With Immortel Shade.*					
5.3	(*a*) Budded at Stake ...	483	567	972	747	878
5.2	(*b*) Budded in Nursery ...	437	536	833	645	859
4.5	(*c*) Seedlings at Stake ...	453	426	710	612	739
5.0	(*d*) Grafted	451	519	866	629	819
	2. *Without Immortel Shade.*					
4.6	(*e*) Budded at Stake ...	410	496	835	538	763
5.3	(*f*) Seedlings at Stake ...	457	577	991	700	873

This field was trenched with pen manure in 1934.

25. The slight differences in yield in this experiment are probably not significant.

26. Each unit clone of ten trees was subdivided into two of five trees each and fertilisers (2 lb. Sulphate of Potash plus 2 lb. Superphosphate per tree) applied to one set of five leaving the other as control. Thus the treated and untreated portions are comparable as populations and the manurial effects will not have the complications found in pure seedling fields. The results are very striking as can be seen from the table below.

Yields in lb. wet cacao per 210 trees.

Treatment.	Clones 1-7.	Clones 8-14.	Clones 15-21.	Clones 22-28.	Total.
Trenched 1935	1,074	851½	1,147¾	1,273½	4,346¾
Trenched 1935 Artificials 1936 ...	1,573½	1,282½	1,586¼	1,616¼	6,058½

Trenched areas gave 12.5 bags per 1,000 pickets (3 1/3 acres).

Trenched plus artificials areas gave 17.5 bags per 1,000 pickets in first year this 5 bag increase cost $80.00=$16.00 per bag.

27. The manures are being applied for 3 years and then the residual effects will be noted.

Colour of Pods Experiment.

28. For details of this experiment the reader is referred to earlier reports. The results to date are given below and show a very great dominance of red over yellow. Although it is believed that some red varieties of cocoa are much hardier than yellow varieties this experiment cannot be considered a proof of that theory. Its chief interest lies in the yields which young budded trees grown without shade in a well drained soil can give without special treatment or manuring.

		Yield lb. Dry Cacao Per Acre.			
		Average 1924-37	1935	1936	1937
Plots.					
1	Seedlings from tree bearing yellow pods	439	956	685	766
8	Seedlings from tree bearing light red pods	315	631	462	386
9	Seedlings from tree bearing dark red pods	399	653	576	827
		1,153	2,240	1,723	1,979

		Yield lb. Dry Cacao Per Acre.			
		Average 1924-37	1935	1936	1937
Plots					
2	Single bud from tree bearing yellow pods	469	1,026	865	1,299
4	Single bud from tree bearing light red pods	385	629	570	696
3	Single bud from tree bearing dark red pods	796	1,135	1,015	1,288
		1,650	2,790	2,550	3,283

		Yield lb. Dry Cacao Per Acre			
		Average 1924-37.			
		Yellow	*Red.*	*Total.*	1937
5	One 'yellow' and one 'red' bud on same stock	147	367	574	955
6	One 'yellow' and one 'red' budded plant at same picket	157	238	395	721
7	One 'yellow' and one 'red' seedling at same picket	62	251	313	533

Trenching at River Estate.

29. The experiment already commenced in Field 3A and described in earlier reports is being continued for the present and results to date are as follows:—

YIELD PER ACRE TRENCHED FIELDS (in pods).

	1932.	1933.	1934.	1935.	1936.	1937.
Debris+Pen Manure	5,703	8,131	6,934	8,189	5,715	5,745
Debris alone	4,906	4,731	4,702	6,502	4,244	3,949
Difference due to Pen Manure ...	797	3,400	2,232	1,687	1,471	1,796

30. Note that the difference in yield ascribable to Pen Manure was greatest in the second crop after trenching and in succeeding crops it decreased but was still apparent in the sixth year.

B. MARPER ESTATE.

General.

31. The Agricultural Officer, Eastern Counties, reports :—

" *Cultivation.*—The normal work of cultivation—cutlassing, pruning and draining, has been carried out as in other years. Spraying with Bordeaux Mixture was accomplished during the dry season over more than half of the estate. Draining received greater attention, about 40,000 feet of drains being opened in Fields 5—10 inclusive

Preparation for Resistant Material.—Two acres of Field VI were cut down, lined and staked at six feet apart. The area was supplied with ground shade preparatory to being planted with resistant material obtained locally and from abroad. Already, 32 budded plants obtained from local estates have been planted and more of these, as well as foreign material to be released from Quarantine are expected to be planted early in 1938.

Rainfall and Crops.—The annual Rainfall Records available and the yields since the estate has been owned by Government are shown in the following table :—

	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.
Rainfall (inches)	—	97.4	101.7	141.8	83·6	108.7	103.8	68.3
Yield (Bags of 165 lbs.) ...	251	196	211	202	204	292	217	195

While an excellent production of young fruit was observed during September, most of it was lost on account of the unusually dry weather which prevailed during the last three months of the year. This dry spell also delayed ripening of the fruit, and the heavy reapings before the close of the year will be reflected in next year's crop. The crop reaped from January to December amounted to 30,486 lb. plantation cacao and 1,755 lb. black cacao which were sold to the Cocoa Planters Association.

Pests and Diseases.—During the past year, thrips infestation was negligible and cacao beetles were very scarce. Rat injury was light and soon brought under proper control. Squirrels were numerous but a large quantity was destroyed by shooting.

A few cases of Canker but no instances of Root Disease were observed. Black pods (*Phytophthora*) were decidedly fewer, possibly on account of the dry weather experienced during the "rainy" season.

Witchbroom Disease was accountable for a loss of 8.67 per cent. of the mature pods this year as compared with 3.84 per cent. the previous year. The incidence of brooms was almost half that of the previous year, being 224,356 as compared with 448,500 for 1936.

Witchbroom Control.—The former programme of removing and destroying brooms in alternate months was replaced by one in which complete rounds were effected every three months. By thus reducing the number of rounds to four per annum it is intended to bring control operations within the limits of a commercial proposition. The cost of labour for removing and destroying brooms during the year amounted to $261.22 which works out at $2.90 per acre, not including supervision.

The known loss of crop as a result of pod infection from 1932 to 1937 is shown in the following table :—

Year.	1932.	1933.	1934.	1935.	1936.	1937.
Loss (per cent.)	0.87	1.25	1.33	1.31	3.84	8.67

The distribution of crop and the incidence of Witchbroom pods during 19 7 are shown in the following table :—

Date of Reaping.	Healthy Pods.	W/B Pods.	Total Pods.	Percentage Diseased.
January 4th	96,592	4,153	100,745	4.12
February 14th	43,529	7,995	51,524	15.51
March 19th	25,236	7,291	32,527	22.41
April 22nd	33,459	3,989	37,448	10.65
May 29th	38,001	1,068	39,069	2.73
June 21st	8,642	161	8,803	1.83
September 24th	3,675	130	3,805	3.50
October 7th	5,423	132	5,555	2.30
October 28th	5,979	405	6,384	6·34
November 20th	12,170	5,308	17,478	30.37
December 4th	46,720	4,573	51,293	8.90
December 19th	77,578	2,529	80,107	3.15
Total	397,004	37,734	434,738	

The number of pods reaped was 434,738 of which 37,734 were affected by Witchbroom disease, representing a loss of 8.67 per cent."

Experimental.

Manurial Experiments.

32. In 1936 these experiments, which had been in operation since 1930, were remodelled for further test. The soil was surveyed and found to be far from constant in type. Potash showed up as the most beneficial fertiliser, lime and phosphate being also useful but not really profitable. Nitrogen appeared to be of little value.

33. In remodelling for half plot treatments each plot was divided into two halves of ten trees each leaving five trees in the middle as a guard row. The lime experiment was given a half plot potash treatment with results shown in Table I. The nitrogen series was given a half plot potash treatment, the results of which are given in Table II.

34. It will be noticed that in both these experiments potash at the rate of 2 lb. per tree conferred a benefit, greater in the case of the lime experiment than the nitrogen experiment.

35. The Potash and Phosphate experiments were given half plot lime treatments at the rate of 5 tons per acre and although in both cases the total of limed versus unlimed plots shows a benefit to liming, the results are not conclusive. This is shown in Tables III and IV.

36. In the potash plus phosphate experiment the half plot lime treatment appeared to be detrimental (Table V) so no general conclusions for liming can be drawn from the results in the first year.

37. In the three remaining experiments where nitrogen had previously been applied with potash, phosphate and both together the nitrogen treatment was omitted from half plots at random. In no experiment were the results consistent enough to approach significance, either of gain or loss due to the omission (*See* Tables VI, VII and VIII).

Summary.

38. Only Potash applications appear to have given significant results.

Table I.—Lime Series—Results in Pods.

Lime applied 1930, *all Dressings and* 1934 *only* 5 *tons per acre treatment.*

Treatment.		Yield in Pods per 50 trees.		Gain 1936-37 over average of 3 preceding years.	Effect of Lime 1936-37.
Old.	1936-37—New.	Average of 3 years before Potash.	1936-37.		
Ca_0	+ Potash	1,143	1,410	+ 267	2,630
Ca_0	— Potash	1,146	1,220	+ 74	
Ca_1	+ Potash	1,426	1,637	+ 211	3,193
Ca_1	— Potash	1,646	1,556	— 90	
Ca_2	+ Potash	1,592	1,896	+ 304	3,661
Ca_2	— Potash	1,836	1,765	— 71	
Ca_3	+ Potash	1,537	2,229	+ 692	3,836
Ca_3	— Potash	1,687	1,607	— 80	

Effect of Lime, 1936-37.

	With Potash.	Without Potash.	Total.
Control —Ca_0	1,410	1,220	2,630
5 tons per acre—Ca_1	1,637	1,556	3,193
10 do. —Ca_2	1,896	1,765	3,661
20 do. —Ca_3	2,229	1,607	3,836
Total	7,172	6,148	

Effect of Lime—Gain on Previous 3 years.

	With Potash.	Without Potash.	Total.
Ca_0	+ 267	+ 74	341
Ca_1	+ 211	— 90	121
Ca_2	+ 304	— 71	233
Ca_3	+ 692	— 80	612
Total	1,474	—157	1,631

= increases of 8 pods per tree. Cost of manures and applying 6½c. per tree.

Table II.—Nitrogen Series.

Nitrogen as usual. Results in pods.

Potash at Rate of 2 lb. per tree to half plots.

Treatment. Old.	Treatment. New.	Average of previous 3 years.	1936-37 yield.	Gain 1936-37.
N_0	N_0K_2	1,061	1,273	212
	N_0	969	1,081	112
N_1	N_1K_2	796	1,138	342
	N_1	876	1,035	159
N_2	N_2K_2	737	932	195
	N_2	907	1,073	166
N_3	N_3K_2	933	1,148	215
	N_3	786	921	135

Effect of Nitrogen. Gain 1936-37 over previous years.

	With Potash	Without Potash.	Total.
N_0	212	112	324
N_1	342	159	501
N_2	195	166	361
N_3	215	135	350
Total	964	572	1,536

Due to potash 392 pods per 200 trees.

Table III.—Potash at Harper 1936-37.

Half plot lime at 5 tons per acre superimposed 1936.

Results in pods.

Treatment. Old.	Treatment. New.	Average for 3 years previous.	Yield 1936-37.	Gain 1936-37.
K_0	CaK_0	805	1,120	315
	K_0	680	801	121
K_1	CaK_1	900	1,161	261
	K_1	1,097	1,429	322
K_2	CaK_2	1,085	1,364	279
	K_2	1,022	1,051	29
K_3	CaK_3	1,133	1,368	235
	K_3	1,310	1,578	268

Effect of Potash. Gain over previous 3 years.

	+Ca.	— Ca.	Total.
K_0	315	121	436
K_1	261	322	583
K_2	279	29	308
K_3	235	268	503
	1,090	740	1,830

Table IV.—Marper Phosphate 1936-37.

Half plot lime at 5 tons per acre superimposed 1936.

Results=Pods.

Treatment. Old.	Treatment. New.	Average yield 3 years previous.	Yield 1936-37.	Gain to 1936-37.
P_o	CaP_o ...	1,069	1,322	253
	P_o	907	920	13
P_1	CaP_1	1,208	1,289	81
	P_1	1,202	1,365	163
P_2	CaP_2	1,341	1,869	528
	P_2	969	1,152	183
P_3	CaP_3	1,420	1,628	208
	P_3	1,024	1,189	165

Effect of Phosphate. Gain over previous 3 years.

	+Ca.	— Ca.	Total.
P_o	253	13	266
P_1	81	163	244
P^2	528	183	711
P_3	208	165	373
	1,070	524	1,594

Table V.—Potash and Phosphate Series

Half plot lime superimposed at 5 tons per acre 1936.

Treatment. Old.	Treatment. New.	Yield Average 3 years.	Yield 1936-37.	Gain 1936-37	KP Result Gain.
K_oP_o	+ Lime	1,283	1,607	+324	469
	— Lime	1,484	1,629	+ 145	
K_1P_1	+ Lime	1,277	1,526	+ 249	588
	— Lime	1,291	1,630	+ 339	
K_2P_2	+ Lime	1,648	2,072	+ 424	981
	— Lime	1,439	1,996	+ 557	
K_3P_3	+ Lime	1,607	1,898	+ 291	707
	— Lime	1,486	1,902	+ 416	

Effect of Potash and Phosphate. Gain over previous 3 years.

	With Lime.	Without Lime.	Total.
K_oP_o	324	145	469
K_1P_1	249	339	588
K_2P_2	424	557	981
K_3P_3	291	416	707
	1,288	1,457	2,745

Table VI.—Nitrogen and Potash.

Withholding Nitrogen from half plots— Yield in Pods.

Treatment.		Yields.		Gain 1936-37.
Old.	New.	Average previous 3 years.	1936-37.	
N_0K_0	N_0K_0	789	917	128*
	N_0K_0	744	866	122
N_1K_1	N_0K_1	878	1,150	272
	N_1K_1	1,003	1,220	117
N_2K_2	N_0K_2	1,008	1,233	225
	N_2K_2	878	976	98
N_3K_3	N_0K_3	868	1,039	171
	N_3K_3	839	1,114	275

Nitrogen and Potash Effects. Gain over previous 3 years.

	N absent.	N present.	Total.
*K_0	125	125	250
K_1	272	117	389
K_2	225	98	323
K_3	171	275	446
	793	615	1,408

* Figures averaged for truer comparison.

Table VII.—Nitrogen and Phosphate at Marper.

Treatment.		Average yield last 3 years.	Yield 1936-37.	Gain due to 1936-37.
Old	New.			
N_0P_0		690	531	— 159*
		835	738	— 97
N_1P_1	— N	864	751	— 113
	+ N	807	843	+ 36
N_2P_2	— N	970	1,134	+ 164
	+ N	982	1,182	+ 200
N_3P_3	— N	840	881	+ 41
	+ N	1,047	1,066	+ 19

Nitrogen Phosphate effects. Gain over previous 3 years.

	N absent.	N present.
P_0	— 128	— 128
P_1	— 113	+ 36
P_2	+ 164	+ 200
P_3	+ 41	+ 19
	— 36	+ 127

* Averaged for truer comparison.

Table VIII.—Marper N P K 1936-37.

Treatment.		Average yield previous 3 years.	Yield 1936-37.	Gain 1936-37.
Old.	New.			
$N_0P_0K_0$	P_0K_0	1,537	1,833	296* } average 181
	$N_0P_0K_0$	1,247	1,313	66 }
$N_1P_1K_1$	P_1K_1	1,616	1,840	224
	$N_1P_1K_1$	1,363	1,505	142
$N_2P_2K_2$	P_2K_2	1,234	1,253	19
	$N_2P_2K_2$	1,488	1,701	213
$N_3P_3K_3$	P_3K_3	1,611	1,742	131
	$N_3P_3K_3$	1,358	1,728	370

N P K effects—Gain over previous 3 years.

	—N	+N	Total.
*P_0K_0	181	181	362
P_1K_1	224	142	366
P_2K_2	19	213	232
P_3K_3	131	370	501
Total	555	906	1,461

* Averaged for truer comparison.

Witchbroom testing nurseries.

39. With the introduction of seedling progeny from resistant cacao trees in Ecuador and the bulking up of material from trees selected in Trinidad for resistance to witchbroom, the witchbroom testing nurseries have to be rapidly extended. A portion of Marper Estate has been clear felled and prepared to receive the first consignment of—

(1) 100 budded tree blocks of local selections
(2) Seedling tree blocks of local selections
(3) Budded tree blocks of Ecuador selections now in quarantine in Barbados.

40. A slight revision of technique has been made with regard to this testing. Previously it was the custom to increase spore incidence artificially over the nurseries and some 95 per cent. of seedlings were being infected and removed. Since no seedlings appear to be immune to this disease, it is evident that all may be killed off by this process before they have a chance of showing resistance. Thus in the new nurseries plants are being grown at 6 feet apart and not showered with infection until they have grown well enough not to die as a result of a single infection. It is hoped that the more promising material from such testing will be retested later in an area where witchbroom on the surrounding trees is not controlled as is necessary at Marper with other experiments to be taken care of.

41. As soon as material can be certified resistant to witchbroom and of a yield and quality standard to warrant sufficient planting in badly infected districts it will be bulked up at Marper for distribution as budded plants.

C—COCOA MANURIAL EXPERIMENTS.

42. The following is a summary of results of fertiliser experiments described in a report prepared for the Cocoa Subsidy Board in September, 1937. Copies of the printed report containing full details of the experiments and results obtained to date have been distributed to planters through the Cocoa Subsidy Board.

43. In the introduction reference is made to early experiments in manuring cacao and the lessons which were learnt from them. The reasons for certain discrepancies are given and the work which led up to more precise experiments is fully described since it forms the foundation on which the present experiments have been modelled.

Acid Clays of San Rafael.

44. The first experiments described were made on Acid Alluvial Clays in the San Rafael district.

45. According to accepted standards these soils are very deficient in available phosphate and it seemed probable that this deficiency was limiting yield. In the first experiment an attempt was made to discover the optimum quantity of superphosphate which could be applied and although at first the heavier applications seemed to give greater responses, after the second year the lowest application proved best, and over a period of four years 300 lb. per acre per annum proved to be the most economical dressing. Up to the present the yield attributable to the application of 1 lb. superphosphate per tree is 130 lb. dry cacao at a total cost of $3.84. Thus as long as cacao is worth an average of more than 3.4 cents per lb. in the field or 4.6 cents in Port-of-Spain, the application would be profitable. Whether the application of 600 and 900 lb. per acre were beyond the optimum or the trees were suffering from sulphate excess is not clear.

46. The second experiment proves that after three annual applications the effect of 900 lb. of Buccaneer phosphate per acre is almost as good as that of 600 lb. superphosphate per acre. Whether the mineral phosphate will eventually prove superior to superphosphate is undecided.

Comparison of Phosphates and Potash—Per Cent. Increase over Control.

Treatment.	1935.	1936.	1937.
Superphosphate	52.7	50.0	68.4
Super+potash	76.4	62.1	86.3
Buccaneer	34.6	45.5	66.1
Buccaneer+potash	52.6	66.7	66.0
Control	—	—	—

47. The third experiment shows that for the first two years soluble phosphates are superior to mineral phosphates for equal weights of phosphate. It is hoped that this experiment will serve to check up the results obtained in Experiment 1 from the heavy application of superphosphate. If the yields from the Nicifos 1 and double Super treated plots pass those from the superphosphate treated plots the evidence for sulphate poisoning will be conclusive.

Comparison of Phosphate Effects Percentage Increase over Control.

Treatment per Tree.	1936.	1937.
3 lb. superphosphate	31.9	53.0
1¼ lb. Nicifos 1	28.3	53.0
1½ lb. double super	35.4	39.0
3 lb. mineral phosphate	11.9	20.4
Control	—	—

In all the experiments potash conferred only a slight benefit, if any, on phosphate and would not pay for application. In two of the experiments there is evidence that nitrogen also has no effect whatever, and is only wasted if applied. Hence, it is neither potash, phosphate nor nitrogen limiting yields at present and for further increases of yield other channels must be pursued. Factors which suggest themselves are aeration of the soil, tillage of soil, addition of organic matter, lowering of water table (which is within 1 foot of the surface for several months of the year) and the reduction of atmospheric humidity by pruning. All these operations are badly needed.

Black Marl of Rio Claro.

48. On the Black Marl soils of the Rio Claro district similar experiments were made.

49. Without doubt phosphates are exceedingly beneficial to Black Marl soil and superphosphate has proved in two successive years to be superior to mineral phosphates. In the second year yields were less than in the first year of the experiment, treatment for treatment, showing again how climatic conditions can seriously reduce crop in spite of fertilising. This is of course important for profitable applications of manures in a good year may be entirely unprofitable in a poor year.

Comparison of Phosphates.

Treatment per Tree.	Per Cent. Increase over Control.	
	1936.	1937.
3 lb. superphosphate	74.1	44.38
1½ lb. double super	40.6	30.00
1¼ lb. Nicifos A	35.3	15.63
3 lb. mineral phosphate	11.2	8.75
Control	—	—

Potash seems to have been of no value to cocoa on this soil.

50. The continued application of gypsum has had deleterious effects but these were not very outstanding. The possibility that a certain amount of gypsum is actually beneficial to cacao on marl soils supports experiments on crops in other countries where calcium has been successfully applied as sulphate on alkaline soils.

Sandy Loam at River Estate.

51. For sandy loam soils at River Estate one "N.P.K." experiment shows the following results after four years :—

(*a*) The sulphate of ammonia plots have decreased more rapidly than the controls in yield over the same period showing that addition of nitrogen has been detrimental.

(*b*) The superphosphate treatment has had no effect alone as the plots thus treated have decreased in yields at the same rate as the control plots.

(*c*) The sulphate potash treated plots actually increased in yield until the residual year, and even then the yields were considerably higher than those of the control plots showing that there has been a residual effect due to this manure.

(*d*) Plots receiving a combination of sulphate of ammonia and superphosphate have decreased in yields much more rapidly than plots receiving these fertilisers singly, supporting the fact that these fertilisers in the absence of potash on River Estate sandy loam soils may be harmful.

(*e*) Plots receiving nitrogen and potash combined have decreased in yields but not as much as for nitrogen alone, showing that potash has tended to alleviate the harmful effect of sulphate of ammonia.

(*f*) Plots receiving potash plus phosphate have shown increases similar to those receiving potash alone, and plots receiving all three manures have behaved in a similar manner.

52. It follows that the only fertiliser of benefit has been sulphate of potash.

53. In the second experiment the results are not quite the same. Nitrogen and phosphate may not be detrimental alone but on this site they both appear to reduce the beneficial effect of potash.

N.P.K. on Sandy Loam.

Treatment.	Average % Increase over Natural Yields.
Control ...	79.34
N ...	92.03
P ...	121.00
K ...	228.4
PK ...	197.7
NK ...	171.8
NPK ...	155.3
NP2K ...	185.6

54. In another experiment where sulphate of potash is contrasted with the cheaper muriate of potash for two consecutive years the results may be summarised as follows :

55. In the 1st experimental year the comparison sulphate of potash *versus* muriate was 2,141 lb. *v.* 2,120 lb. of cacao and in the second year the comparison is 2,255 lb. to 2,263 lb. cacao.

56. It is evident that

(*a*) Sulphate and muriate of potash for two consecutive years are equal in value, weight for weight.

(*b*) That phosphate here again improves the yields of cacao when potash is not limiting.

(*c*) That sulphate of ammonia is of no value.

(*d*) That Nicifos C is of less value than plain superphosphate but somewhat better than the equivalent mixture of superphosphate and sulphate of ammonia made locally.

57. This again supports the results obtained for other soil types where phosphate and not potash is limiting cacao yields.

Comparison of Phosphate on Sandy Loam after Potash applied.

Treatment.	Average per cent. Increase over Control in 2 years.
Superphosphate	22.30
Nicifos C	11.28
Sulphate of ammonia	1.15
Super and ammonia	—5.49 (decrease)
Control	—

58. The yield from the plots which received only potash averaged more than 17 bags per 1,000 pickets per annum over the two years and for the potash+superphosphate plots the average yield was approximately 22 bags per 1,000. Eight bags per 1,000 pickets is considered a good yield for Trinidad.

59. In other experiments it appears as though 1 lb. of potash is the optimum dose without superphosphate or 2 lb. of potash with an equal weight of superphosphate. Lime showed no benefit in the first year.

60. The mulch and organic manure trials have shown that potash, phosphate and mulch have each increased yields by amounts such as would occur by chance less than once in 100 trials. The harmful interactions of nitrogen with potash and with phosphate would occur by chance less than once in twenty trials.

61. It is evident that the effect of sulphate of ammonia has in each case been to reduce the beneficial effects of phosphate and potash.

62. The soil on which this experiment was laid down was known to be deficient in potash and phosphate according to standards evolved by examination of highly fertile soils in conjunction with previous manurial experiments. In the past many cacao planters have applied sulphate of ammonia to their fields but no beneficial effect has ever been reported. Other experiments have supported the fact that sulphate of ammonia may be harmful rather than beneficial to cacao. On the other hand pen manure has always been reported to be extremely beneficial especially to sandy soils. It was this benefit long known to result from applications of pen manure which led planters originally to apply sulphate of ammonia as a substitute source of nitrogen since decreasing number of cattle were being kept.

63. It would appear that the benefit derived from pen manure is due largely to its carbohydrate content and not to its nitrogen content. Hardy has shown (Cocoa Research Reports 1931-35) that one of the essentials of the soil of a good cacao field is a high ratio of carbohydrate to nitrogen. As yet no explanation is available for with possibilities of mycorrhizal symbiosis the value of carbohydrate in the soil may be partly to provide energy for the fungus as well as in providing a spongy humic medium to hold water, potash and phosphate ready for the cacao trees. If there is much value in mulch as an energy giver then results will be shown in an experiment recently laid down to test the possible benefit of application of sugar (as a source of carbohydrate) to the cacao soils.

64. Other experiments support the above result that lime gives no benefit in the first year to sandy loam soils at River Estate but that both trenching and artificials *have* conferred a benefit in the *first* year. Applying pen manure as a mulch lightly forked in has given quicker results than trenching.

65. Very poor results were obtained from experiments on Sangre Grande alluvium. Apart from such troubles as thrips and flooding the Sangre Grande alluvium cacao trees have probably been fighting against actual soil poverty and unfortunate climatic conditions for several years which must be reflected in their general state of vitality. In citrus, it is known that under these conditions trees cannot respond to fertiliser and cultural treatments with the alacrity of healthy trees and the same may reasonably be true of cacao.

66. No results at all were obtained on Brasso Clay soils.

67. On a very phosphate deficient acid alluvial clay at Guapo, the results indicate in the first year that although slight increases of yield appear to be obtained as a result of phosphate application these are small and not statistically significant. Also there is comparatively little margin between the response to Buccaneer and superphosphate.

68. The remainder of the report deals with smaller test experiments which support the findings from Latin square experiments on the same soil type remarkably well.

D.—TONKA BEAN EXPERIMENTS.

69. There have been very disappointing results from Tonka Bean Fertiliser experiments on mature trees and it is concluded that there is so much tree to tree variability in age, size and inclination to bear fruit that no results of value will be obtained until more uniform material is available for use.

70. The manurial experiments on young Tonka Beans are being continued and cultural experiments conducted at River Estate have been reported above.

71. Dwarf Tonka Bean trees of two types have been discovered, the first being slow growing trees of normal appearance and the other being truly dwarf with very much shortened internodes. The planter who owns the latter has promised to co-operate with the Department in testing those trees as dwarfing stocks.

E.—COCONUT EXPERIMENTS.

72. Two new N P K experiments have been laid down on Coconuts, one at Palmiste Estate, San Fernando and the other at La Florissante Estate, Arouca. Both are designed to give information on the reaction of coconuts to additions of nitrogen, potash and phosphate. The first experiment is on Naparima Clay Marl and the second is on the acid detrital of the Northern Range.

73. Owing to the kind offer by Mr. J. Phillips to carry out coconut experiments on Friendship Estate in Tobago the estate has been roughly surveyed and soil analyses made. Experiments involving the use of disintegrated coconut husk as mulch to conserve water and the ash of coconut husks as a fertiliser together with normal fertiliser programmes are contemplated.

74. The great difficulty about coconut experiments in Trinidad is to find labourers willing to pick nuts.

F.—GRENADA COCOA EXPERIMENTS.

75. In the Report for 1936 mention was made of a new series of manurial experiments which were contemplated. Provision has been made by the Superintendent of Agriculture for one or more examples of each of the experiments suggested so that results should be forthcoming in the near future.

G.—VISIT TO ECUADOR.

76. The continued spread of witchbroom in the colony during the last few years has placed the cacao industry on a very precarious footing. Efforts to find resistant trees have been extended over larger areas and some promising trees have been located.

77. It was decided that another visit should be made to Ecuador to study the progress made in that country since Mr. F. Stell's visit in 1933 in the location and propagation of resistant trees.

78. A report of this visit was submitted and published as Council Paper No. 115 of 1937.

79. There are many acres of young trees in Ecuador which are claimed to be seedling progeny of certain original " refactario " trees. Although now no one claims that these trees are immune to the disease it is an unquestionable fact that many are resistant and a few, at the age of 9 years, combine high resistance with splendid yields.

80. The important fact about these trees is that they do not belong to the " Nacional " population for which Ecuador is famed but are claimed to be the descendants of material introduced from Trinidad.

81. The presence on many Ecuador estates of trees belonging to the Trinitario Complex, many of them bearing pigmented pods, shows that there is some truth in the story of introductions from Trinidad but the outstanding resistant trees come from parents which bear unpigmented pods and belong to types not common in Trinidad if they occur at all.

82. This led to an hypothesis that there had been more than one introduction of " foreign" cacao into Ecuador and that material had been introduced from the Amazon Valley at some time.

83. By arrangement with the Government of Ecuador and the planters concerned material was collected from some eighty of what appeared to be the most resistant trees between the ages of six and nine years. This was submitted to Barbados for quarantine against Monilia disease and when the seedlings have grown sufficiently the material will be transferred to Trinidad and subjected to special tests for resistance to witchbroom.

84. It was a very striking feature about Ecuador plantations in certain districts, where the early cessation of the rains caused the usual wet season flush to take place in the dry season, that there were relatively few twig brooms on the outside of the canopy. Inside the canopy there was no shortage of starbrooms. Some of the best of the resistant trees were growing relatively less shaded than normal but it did not follow that all trees under these conditions showed less disease, some, probably the most susceptible, seemed to have more than normal intensity of infection.

85. In November a second expedition was equipped to explore the Amazon Valley in search of resistant or immune material. The proposed route was to follow the Amazon to Iquitos in Peru and there make a base camp to explore the headwater tributaries of the river. The full report of this second expedition will not be available until later.

H.—MISCELLANEOUS CROPS.

(1) *Avocado Pears.*

86. Certain types selected by the Staff of the Low Temperature Station as possessing best shipping qualities are being propagated in the event of a future trade in this crop.

(2) *Derris.*

87. The varieties growing at St. Augustine Experiment Station have been propagated and recently samples of roots were submitted to the Imperial Institute for report.

(3) *Castor Oil.*

88. On account of the recent demand for Castor seed oil as a lubricant for aero engines new interest has been given this crop. The local varieties of castor seed are small and to supplement them other varieties from India have been written for.

F. J. POUND,
Agronomist.

REPORT OF THE MANAGER, RIVER ESTATE FOR 1937.

The year was a somewhat eventful one and several outstanding features marked its progress Weather conditions were altogether abnormal, being characterized by a prolonged although not very severe dry season which extended well into the latter part of the year. This exceptionally long dry spell was followed by very heavy rains during the latter part of December for which month a total of 10.25 inches was recorded. Of this amount 5 inches fell on the 23rd as a consequence of which there was flooding and some damage to young cultivations and roads. The total rainfall registered during the year was 59.73 inches of which amount only 9.74 inches fell beteewn 1st January and 31st May.

2. Cacao prices during the early part of the year reached an average high level which had not been attained for many years, but unfortunately the latter half of the year witnessed a proportionately rapid decline of the market. Price fluctuations ranged from approximately $16.00 per fanega in January to $6.75 per fanega in December.

3. The repercussion of the oilfields and sugar estates strikes was felt at River Estate when on the 28th June labourers struck for more wages. Some months previous to the strike a general increase of wages had been granted to all labourers, to meet which a special supplementary vote of $2,000.00 was sanctioned. Most men workers were raised from 45c. to 50c. and women from 30c. to 33c. per day. This strike coming when it did, and despite the fact that River Estate has always paid at least 10 per cent. more wages than any other cacao estate in the colony, was an ungrateful gesture on the part of labour. Following the strike there was a further adjustment in the scale of wages when most women workers were increased from 33c. to 35c. and other adjustments made among certain of the older hands, the lorry-driver stock-keeper, watchman, &c., betterment of working conditions generally and introduction of the 8-hour day. It is disconcerting, however, to observe that labour has shown no appreciation of this betterment of conditions.

4. Other prominent features of a more agreeable nature were the record crops reaped from limes, grapefruit and oranges which together with the good cacao prices obtained during the first half of the year were mainly responsible for the record amount of revenue collected. The figures for the cacao crop for the last five years are given below :—

	1933.	1934.	1935.	1936.	1937.
Total bags of 165 lb. ...	1,164	1,199	1,232	1,021	1,011
Acreage	440	440	418	418	397
Bags per acre	2.64	2.72	2.94	2.63	2.55

Revenue and Expenditure.

Revenue.

5. The total revenue for the year amounted to the record sum of $25,640.97 of which total, sums of $7,021.43 and $195.74 were derived from subsidiary crops and pasture fees respectively.

6. Selected cacao pods to the value of $350.10 were supplied free of charge to the St. Augustine Nursery for raising plants for distribution to planters under the Cacao Subsidy Scheme, and budded cacao plants valued at $60.00 were supplied to the Agronomist for experimental purposes in various parts of the Colony.

7. There is also to the credit of the estate with the Cacao Planters' Association deferred deposit funds to the value of $2,235.65 and scrip certificate are held from the Citrus Growers' Association amounting to $1,191.01.

Expenditure.

8. The total expenditure amounted to $27,505.70; of this amount expenditure on capital, purely experimental work, on subsidiary crops, timber plantations, purchase of a new lorry, a mule and a horse, together amounted to a sum of $8,449.88. A further sum of $2,299.43 was expended under the Cocoa, Subsidy grant, an account of which is given later in this report.

9. In considering expenditure, all of which has been greatly augmented as a result of the increased cost of wages, expansion of experimental work and new plantations, it must be borne in mind that River Estate is essentially an experiment station, dealing with a diversity of crops scattered over a very large area, under not always congenial conditions and cannot be ranked as a purely commercial concern.

Cacao.

10. The cacao crop was somewhat short and amounted to 1,011 bags of 165 lb. each as against 1,021 bags obtained in 1936 and 1,232 bags in 1935. This shortage was due to two main causes, *viz.*: the continued reduction of the area under cacao, and the abnormally dry weather during the latter part of the year which considerably delayed the ripening of produce that would otherwise have matured in time to permit of reaping, curing and marketing before the close of the year.

The crop was disposed of as usual through the Cocoa Planters' Association, who paid an average price of 11¼c. per lb. for first grade cacao.

11. The cultivation was well maintained and the usual routine work was carried out in all fields with particular attention to pruning, supplying and witchbroom control. The following fields or parts of fields were trenched with pen manure during the year—the whole portion west of the river in No. 2A., half of the non-shaded portion of field No. 5 was trenched with manure, while the other half was broadcasted with a similar amount of manure which was forked in. The small portion of this field west of the river was also thoroughly trenched with manure. Trenching with manure was also carried out on the remaining pure cacao section of No. 12, which had not been completed in 1936, and also in the 10 × 10 feet distance planting plot in field No. 18A and in one acre of poor cacao in No. 10A. During the year some two acres of bearing cacao was cut out in field No. 7B for the new Imperial College experiments, and also the non-shaded portions of Nos. 20C and D for the planting of Foster grapefruit and Criollo cacao respectively. About one acre each of Nos. 19, 20B and 24 were cleared to make way for Criollo cacao plants, King oranges and T1. limes respectively.

Cacao Subsidy.

12. Expenditure under the subsidy grant amounted to $2,299.43 and was allocated under three main heads as follows:—

	$ c.
A. Cacao Rehabilitation	1,547 60
B. Interplanting Auxiliary Crops	431 09
C. Replacement of Cacao	320 74

13. The rehabilitated fields are the pure cacao sections of Nos. 12, 13A and B., the whole of Nos. 5 and 16 and one acre each of No. 18A (10 × 10 feet distance planting plot) and No. 10A. Supplies in these fields were all given an application of pen manure, kept as free as possible of weeds and all fields were pruned and combed for witchbroom. Fertilizer treatment was as in 1936, *i.e.*, 2 lb. each per tree of sulphate of potash and superphosphate, applied to Nos. 13 A. and B, 8 A.B.C. and No. 9C. Three acres of No. 5 were treated with pen manure, part trenched and part broadcasted and forked in. One acre of the distance planting plots (10 × 10 feet) in field No. 18 A was thoroughly trenched with pen manure as also one acre in No. 10A.

14. The areas interplanted in 1936 in parts of Fields Nos. 4A, 11, 12, 13A and B, 17A and B and 8B were well maintained and those in Nos. 17A and B were considerably extended. All young plants received an application of pen manure and were kept free of weeds and thoroughly mulched. About 5 acres of Nos. 1A and B were interplanted late during the year. The crops used to supersede cacao are tonka beans and coffee, except in field No. 4A where mixed timber trees have been interplanted. The progress made to date in all interplanted fields has been satisfactory.

15. Replacement of cacao was carried out in parts of fields Nos. 20B, C and D and a small portion of No. 24. The crops substituted for cacao were King oranges in No. 20B, Foster grapefruit in No. 20C, T1. limes in No. 24 whilst No. 20D has been cleared, lined, drained and planted up with ground shade in preparation for setting out criollo cacao with the coming wet season.

16. The granting of this subsidy has proved of very great import to the colony at large, not merely for the part it has played and continues to play in bolstering up a tottering cacao industry, and the impetus it has given to the establishment and maintenance of subsidiary crops, but it has also gone a very long way toward easing the labour situation, and so far as River Estate is concerned has rendered possible the granting of a full fortnight's work to all employees throughout the year.

Diseases and Pests.

17. Witchbroom disease is widespread throughout the cultivation and its control has now become a regular item of expenditure. The incidence of pod infection is rapidly on the increase and caused some loss of crop. Thrips infestation was not so severe or general as during the previous few years and was limited to certain exposed or otherwise unhealthy areas. The comparatively dry weather during the months of September, October and November, was undoubtedly the controlling factor in this instance. Cacao beetles were again very active and their control has also become a fixed item of expenditure not only during the dry season as formerly but throughout the year.

Grapefruit and Oranges.

18. These crops were record ones and revenue from them also reached its peak. Produce was disposed of as follows :—

	$ c.	$ c.
Grapefruit.		
3,944 cases shipped to Packers realized	1,594 16	
Seeded and culled fruit sold locally	130 92	1,725 08
Oranges.		
536 cases shipped to Packers realized	344 34	
Navels, King and Cocoa oranges sold locally ...	477 34	821 68
Shaddocks sold locally realized		29 75
		2,576 51

19. Besides this several thousands of fruit were lost through being held on the trees for too long a period of dry weather pending order from the Packing Shed. Fertilizer as applied during previous years and consisting of 2 lb. Ammo-phos and 1 lb. sulphate of potash per tree was applied throughout. The older or eastern portion of the field south of the Mango plot received an application of pen manure and the cultivation in general was given the usual routine treatment. There was a severe outbreak of scab among the King oranges towards the end of the year which resulted in some loss of fruit.

Mangoes.

20. There was a small crop of Julie mangoes which brought in $71.32 by way of revenue. Owing to the unsuitability of this crop to its particular locality, it has been decided gradually to substitute some other crop of more economic value.

Limes.

21. This crop again made a considerable advance on previous years' results and reached a total of 2,009 barrels of 160 lb. each. The crop was sold to a local factory at $1.50 per barrel which, together with small local sales, realized a sum of $3,050.16.

22. The crops during the past four years have been as follows :—

1934.	1935.	1936.	1937.
barrels.	*barrels.*	*barrels.*	*barrels.*
760	901	1,581	2,009

23. The usual fertilizer treatment of 2 lb. Ammo-phos and 1 lb. sulphate of potash per tree was applied and some attention was given to drainage but much more remains to be done in this direction. During the year 1,600 feet of new bridle road was constructed in the young lime field north of field No. 24 and two small contracts were taken over.

24. The T 1. limes planted in Field No. 24 also yielded a small crop.

Tonka Beans.

25. This crop was poor as compared with that of the previous year. In 1936 two thieves were caught and convicted for stealing and there is reason to believe that there was more larceny in 1937, but no definite information could be obtained to warrant proceedings against the suspects. Larceny of this crop throughout the colony generally seems to have assumed considerable proportions.

26. The following is a resume of the disposal of the crop :—

	lb.		$ c.
Beans sold to Port-of-Spain merchant	165	=	224 69
12,650 pods for plants sold to planters...	70	=	111 15
5,355 pods for plants (River Estate and contractors)	29		—
	264		$335 84
500 plants sold at 8c. each			40 00
			$375 84

27. The large areas planted during the past few years as pure stands and interplanted in poor cacao fields have been well attended to and are making very satisfactory progress.

Coffee.

28. The Robusta coffee crop was fairly good and amounted to 5,950 lb. which realized a sum of $358.03. The old trees in Fields Nos. 14 and 15 have grown very large and woody and are now ceasing to be economic. The question of replanting a small portion of this area every year either with coffee or some other crop must soon be considered.

Timber.

29. Beyond cutlassing and maintenance of roads there was little opportunity for thinning, removal of diseased trees, &c. Many cankered cypre trees require cutting back to ground level and moulding up with soil. Such treatment induces the growth of powerful and quick growing shoots from which a final selection may be made. Trees renewed by this means quickly outstrip ordinary seedling plants and appear to be highly resistant to canker. These plantations as they exist to-day, and comprised as they are of so many different kinds of timber trees in various stages of growth and development, subjected to varying degrees of cultivation, treatment, soil and environmental conditions, successes and failures, offer a vast field of investigation and research to a student of tropical afforestation, and it is a pity that facilities and staff do not exist at River Estate to take advantage of such an opportunity.

30. During the year four more contracts were taken over.

Experimental Work.

31. This work has been extended beyond cacao and now includes Tonka Beans, Coffee and Limes. Strict attention has been paid to applications of fertilizers and recording of yields. Several new series of experiments were laid down during the year which include a four acre Robusta coffee variety trial of the best types found in the island, and the new Imperial College cacao experiment in Field No. 7B to test six selections propagated by cuttings and buds on seedling stock. The twelve acre variety trial plot which is now four and a half years old has made remarkable growth despite repeated attacks by thrips and cocoa beetles. All experiments are fully dealt with by the Agronomist in his report and need not be dilated upon here.

Miscellaneous Crops.

32. These comprise plots of Pimento, Clove, Budded Avocado Pears, Derris and Langstat (*Lansium domesticum*). The avocado pears and derris have made particularly fine growth. Small patches of Gros Michel bananas are interplanted over various parts of the estate as temporary shade and during the year 155 bunches were sold to the Banana Board for $59.00. About 1,000 Papaw trees were interplanted in Fields Nos. 20C and 23C with Foster grapefruit and Robusta coffee. Over fifty per cent. however, of these papaw trees have turned out to be males.

Stock.

33. The mare "Patricia" was seriously injured in an accident with a Bus last July and had to be destroyed. She was a very useful animal and is much missed. The two old mules "Baltic" and "Winter" are fast breaking up and the former has developed ulcerous sores about the body which have rendered him unfit for work since some three months. A small mule and pony were purchased from Tobago about the middle of the year for $240.00. Our field transport is therefore severely handicapped. The stock at the end of the year comprised :—4 horses, 4 mules, 3 cows, 2 heifers, 1 heifer-calf, 1 bull-calf and 1 pure bred Holstein bull.

34. Pasture and service fees for the year amounted to $195.74.

Motor Lorry.

35. A new Ford motor lorry was purchased in November. It was necessary during the year to hire a truck on several occasions to help in the transport of produce and fertilizers and with the growing transport requirements of the estate, the question of acquring a second truck must soon be considered.

Buildings and Yard.

36. A new two-room office was constructed early in the year by the Public Works Department. This has proved of great convenience and relieved much office congestion. The Public Works Department also carried out some minor repairs and painting of overseer's quarters and labourers' barracks, but this work has not yet been completed. A new fence was erected around the Manager's quarters which has greatly enhanced the appearance of that building. A small portion of the yard between the estate office and manager's quarters was thoroughly surfaced and oiled. General sanitation was well looked after.

Visitors.

37. Visits by planters to the estate were numerous throughout the year. Their Excellencies, Sir Murchison Fletcher and Sir Mark Young visited and inspected the buildings and fields. The staff and students of the Imperial College of Tropical Agriculture paid their annual visit on January 13th ; members of the Sangre Grande District Agricultural Society visited on October 16th and the Agricultural Society of Trinidad and Tobago visited on the 18th November. Sir Arthur Pugh of the Commission of Enquiry also visited the estate and expressed his appreciation of the housing accommodation for labourers. Officers of the Departmnt of Agriculture and Imperial College paid frequent visits during the year.

Staff.

38. The granting of funds under the Cocoa Subsidy Scheme, the increase in the number and variety of experiments and the marked improvement in the estate generally has entailed a great deal of extra work on all members of the staff who performed their duties in a very satisfactory manner.

39. Statements in connection with the working of the estate are attached.

RODERICK O'CONNOR,
Manager, River Estate.

RIVER ESTATE.

Statement of Revenue and Expenditure for the year ended 31st December, 1937.

Particulars.			Revenue.	Particulars.		Expenditure.
	$	c.	$ c.			$ c
By sale of :—				Personal Emoluments		5,244 00
Cacao (Manufactured)	18,326	84		65—Maintenance		14,818 28
Cacao Pods	96	96	18,423 80	66—Travelling and Transport ...		1,707 49
Grapefruit	1,725	08		67—Incidentals		323 31
Oranges	821	68		68—Timber Contracts		846 34
Shaddocks	29	75	2,576 51	69—Improvements		1,740 68
Mangoes	71	32	71 32	70—Fertilizers		497 30
Limes			2,050 16	71—Materials		722 83
Tonka Beans			375 84	72—Stock (Feed for)		630 64
Coffee			358 03	73—New Cacao Varieties... ...		734 83
Pasture and Service Fees ...			195 74	74—Purchase of Mules		240 00
Miscellaneous :—				*Cacao Subsidy* :—		
Firewood, Provisions, &c. ...			378 43	*Expenditure* ...	$2,299 43	
Bananas			211 14			
			$25,640 97			$27,505 70

RIVER ESTATE.

Rainfall for the year ended 31st December, 1937.

Date.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Grand Total.
1 ...	—	—	—	—	—	—	.44	—	—	.61	—	.95	
2 ...	.04	.40	.10	—	—	—	—	.10	—	—	—	.52	
3 ...	.10	.10	.32	—	—	—	—	—	—	.35	—	—	
4 ...	.13	—	—	.21	—	.60	.38	—	.62	.25	—	—	
5 ...	1.22	—	.12	—	—	—	1.00	.25	.39	—	—	.50	
6 ...	—	—	—	—	—	—	.32	—	—	.62	.13	.10	
7 ...	—	—	.40	—	—	—	—	.70	.49	—	.50	.20	
8 ...	—	—	—	—	—	—	.38	—	—	—	.51	—	
9 ...	—	—	—	—	—	—	—	—	—	—	1.10	—	
10 ...	.38	—	—	—	—	.12	.21	—	—	—	.10	—	
11 ...	.10	.02	—	—	—	.92	.29	.20	—	1.20	—	—	
12 ...	.12	.15	—	—	—	1.05	—	—	.42	.54	—	.28	
13 ...	—	—	—	—	—	.58	.90	—	.55	—	—	.35	
14 ...	—	—	—	—	—	—	.16	.48	.15	—	—	.09	
15 ...	—	—	—	—	—	—	—	.11	—	—	2.81	.35	
16 ...	.04	—	—	—	.17	—	.06	1.26	—	.90	.38	—	
17 ...	—	—	.10	—	—	.85	—	1.16	—	—	.25	.40	
18 ...	.31	.16	—	—	—	—	.60	—	.07	.15	.65	—	
19 ...	—	—	—	—	—	—	—	—	—	—	—	—	
20 ...	.34	—	—	—	—	.19	.25	—	—	—	.25	—	
21 ...	.10	—	—	—	—	—	—	—	.28	—	—	—	
22 ...	.48	.04	—	—	.10	—	—	.20	—	—	—	—	
23 ...	—	—	—	—	—	1.34	—	.62	—	—	.24	5.00	
24 ...	.12	—	.26	.85	—	.11	—	—	—	—	—	.34	
25 ...	.29	—	—	.21	—	—	.16	1.50	—	—	—	.20	
26 ...	.35	—	—	1.30	—	—	1.45	.28	—	—	.25	.14	
27 ...	—	—	—	—	.11	.14	—	.09	—	—	—	.18	
28 ...	—	—	—	—	—	.12	—	—	.45	—	.24	.65	
29 ...	—	—	—	.50	—	—	.06	—	—	.14	.56	—	
30 ...	—	—	—	—	—	1.50	—	.80	.45	.26	—	—	
31 ...	—	—	—	—	—	—	—	.10	—	.85	—	—	
Total ...	4.12	.87	1.30	3.07	.38	7.52	6.66	7.85	3.87	5.87	7.97	10.25	59.73

RIVER ESTATE.

Progress Abstract of Expenditure for the year 1937.

	$ c.	$ c.
"A"—Staff :		
Manager	2,280 00	
Overseer, Drivers, Watchmen	3,661 62	
Travelling, Messenger, &c.	389 95	6,331 57
"B"—Maintenance :		
Roads and Bridges	336 62	
Buildings, Repairs, &c.	276 20	
Yard and Sanitation	842 00	
Grass Field	—	
Pastures	182 17	
Water—Service and River	43 93	
Materials (Tools, Bags, &c.)	885 71	
Visitors and other Public Services	724 45	
Miscellaneous (Fire Control)	16 00	3,307 08
"C"—Stock :		
Labour (Stock-keeper, grass cutter, &c.)	876 99	
Materials (includes $240 for purchase of 1 horse and 1 mule), Stock feed, &c.	877 56	1,754 55
"D"—Lorries :		
Labour (Driver and Attendant)	646 75	
Upkeep (includes $682.02 purchase of 1 Ford V8 truck), Gasolene, &c.	1,312 28	1,959 03
"E"—Nurseries :		
Establishment		
Maintenance	105 33	105 33
Total "A" to "E"		13,457 56
"F"—Cocoa Cultivation :		
Cutlassng	1,038 38	
Weeding and Stumping	671 81	
Trenching and Mulching, Manuring	365 16	
Supplying Cocoa and Ground Shade	31 30	
Pruning	1,138 15	
Draining and Roundridging	248 36	
Burying Pods—Bury Cacao Shells	147 31	
Shade Control	52 73	
Hedges and Borders	78 92	
Diseases and Pests, ants, beetles, squirrels	183 81	
Witchbroom	396 28	
Miscellaneous	5 40	4,357 61
"G"—Cocoa Manufacture :		
Reaping	1,719 70	
Curing	442 97	2,162 67
Total "F" and "G"		6,520 28
"H"—Cocoa Experiments :		
Labour	1,772 97	
Materials	57 78	1,830 75
"I"—Orchard—Grapefruit and Oranges :		
Upkeep (cutlassing, weeding and supplying)	951 65	
Manuring (fertilizers)	262 25	
Reaping	170 78	1,384 68
"J"—Limes :		
Upkeep (cutlassing, supplying, &c.)	320 75	
Manuring (fertilizers)	261 75	
Reaping	567 04	1,149 54
"K"—Tonka Beans :		
Upkeep (cutlassing, &c.)	129 63	
Manuring (fertilizers)	2 00	
Reaping	14 34	145 97
"L"—Coffee :		
Upkeep (cutlassing, &c.)	8 00	
Manuring	—	
Reaping and Hulling	168 13	176 13
Total "I" to "L"		2,856 32
"M"—Timber Cultivation :		
Upkeep (cutlassing, &c.)	357 64	
Roads and Bridges	71 84	
Reaping, Sawing and Transport of Timber	154 30	583 78
"N"—Extraordinary :		
New Cultivations—		
Limes	206 10	
Bananas	37 27	
Tonka Beans and Coffee	963 32	
Timber	102 28	
New Roads, New Bridges and Buildings	434 70	
Purchase of Contracts and Advances	335 84	
Miscellaneous—Oiling yard	145 79	
Derris (new cultivation)	31 71	2,257 01
Grand Total		27,505 70

Field No.	Bearing Trees.	Half Trees.	Quarter Trees.	Supplies	Dead or missing.	Total.	Acreage.	Approx. Age.	No. bags of 165 lb.	No. bags per acre.	Remarks.
1 A ...	1,794	215	161	40	552	2,762	10.0	34-40	21.21	2.1	Trenched without manure 1931, 1932, 1933. About 3 acres interplanted with Tonka Bean and Coffee in 1937. Interplanting to be continued during 1938.
B ...	1,145	114	117	24	377	1,777	6.0	34-40	5.87	·9	Trenched without manure 1931, 1932, 1933. About 2 acres interplanted with Tonka Bean and Coffee in 1937. Interplanting to be continued during 1938.
2 A ...	1,444	247	171	179	148	2,189	11.1	64-70	18.75	1.7	Experimental Field. Replacement of poor bearers. Front portion west of river trenched with pen-manure 1937.
B ...	1,331	276	139	100	55	1,901	9.6	64-70	17.73	1.8	Experimental Field. Replacement of poor bearers.
3 A ...	1,824	361	141	196	129	2,651	13.3	64-70	22.91	1.7	Part trenched without manure. Part trenched with manure. Part fertilized in 1931.
B ...	1,572	250	67	25	291	2,205	11.3	64-70	14.83	1.3	No special treatment. About 4 acres in very bad condition.
4 A ...	967	64	9	299	13	1,352	5.0	54-65	7.88	1.6	No special treatment. 4 acres derelict cocoa not included here interplanted with timber in 1936.
B ...	1,854	46	13	578	24	2,515	8.0	54-65	11.27	1.4	No special treatment. 2 acres derelict cocoa not included here planted with Tonka Bean and Coffee in 1937.
5 ...	2,484	189	147	174	112	3,106	16.4	64-70	31.03	1.9	Whole field rehabilitated since 1936. Part of no-shade portion trenched with pen-manure and part pen-manured and forked. Small portion west of river trenched with pen-manure 1937.
6 A ...	2,726	68	99	21	155	3,069	10.2	34-40	33.80	3.3	Trenched with manure 1933. Fertilized 1936 with 2 lb. sulphate of potash and 2 lb. superphosphate per tree.
B ...	1,849	52	76	8	218	2,203	7.3	34-40	17.60	2.4	Trenched with manure 1933. Fertilized 1936 with 2 lb. sulphate of potash and 2 lb. superphosphate per tree.
C ...	1,727	47	69	10	121	1,974	6.6	34-40	15.52	2.3	Trenched with manure 1933. Fertilized 1936 with 2 lb. sulphate of potash and 2 lb. superphosphate per tree.
7 A ...	2,314	112	118	50	89	2,683	8.6	34-40	17.23	2.0	Trenched with manure 1925.
B ...	1,774	81	91	10	62	2,018	6.5	34-40	15.47	2.4	2 acres cut out in 1937 for new I.C.T.A. experiment.
8 A ...	3,557	79	306	179	214	4,335	14.5	34-40	52.61	3.6	Trenched with manure 1927. Fertilized 1936 and 1937 with 2 lb. sulphate of potash and 2 lb. superphosphate per tree.
B ...	1,398	66	105	95	108	1,772	6.0	34-40	21.00	3.5	Trenched with manure 1927. Fertilized 1936 and 1937 with 2 lb. sulphate of potash and 2 lb. superphosphate per tree.

COUNTING AND CROP RETURNS FOR THE YEAR 1937.—CONTINUED.

Field No.	Bearing Trees.	Half Trees.	Quarter Trees.	Supplies	Dead or missing.	Total.	Acreage.	Approx. Age.	No. bags of 165 lb.	No. bags per acre.	Remarks.
C ...	1,708	66	206	171	202	2,353	7.8	34-40	28.54	3.6	Trenched with manure 1927. Fertilized 1936 and 1937 with 2 lb. sulphate of potash and 2 lb. superphosphate per tree.
9 A ...	1,839	119	158	74	115	2,305	7.8	34-40	23.10	2.9	Trenched with manure 1928. Fertilizer experiment plots.
B ...	1,794	60	71	9	174	2,108	7.0	34-40	24.24	3·4	Trenched with manure 1928-29. Fertilizer and Pen-manure experiment plots.
C ...	2,461	129	138	249	137	3,114	10·4	34-40	38.54	3.7	Trenched with manure 1929-30. Dr. Briton-Jones' pruning experiment 1936 Fertilized 1936 and 1937 with same treatment as No. 8.
10 A ...	1,574	87	73	585	—	2,319	7.5	34-40	16.20	2.1	Trenched with manure 1930-31. Draining and Fertilizer experiment. 1 acre trenched with pen-manure 1937.
B ...	2,034	107	103	533	—	2,777	9.2	34-40	24.34	2.6	Trenched with manure 1930-31.
11 ...	1,652	185	294	31	220	2,382	8.0	34-40	19.30	2.4	Trenched without manure 1933.
12 ...	1,657	191	753	767	92	3,460	13.8	34-45	21.87	1.6	Pure cocoa section trenched with pen-manure 1936-37. About 5 acres interplanted with Tonka Beans and Coffee in 1936.
13 A ...	2,371	105	141	185	673	3,475	14.0	34-45	43.28	3.9	Cocoa rehabilitated portion fertilized in 1936 and 1937. Rest of field interplanted with Tonka Beans and Coffee 1936 and 1937.
B ...	1,573	96	82	1	215	1,967	7.8	34-45	33.20	4.2	Cocoa rehabilitated portion fertilized in 1936 and 1937. Remaining small portion interplanted with Tonka Bean and Coffee 1937.
14 ...	600	56	27	1	217	901	3.0	64-70	3.10	1.0	Very old field. All interplanted with Robusta Coffee.
15 ...	540	40	26	—	305	911	3.0	35-95	2.57	.8	Very old field. All interplanted with Robusta Coffee.
16 ...	1,472	59	111	485	71	2,198	7.3	35-70	27.50	3.7	Rehabilitated and trenched with pen-manure in 1936.
17 A ...	2,603	290	168	489	533	4,083	13.3	34-39	21.97	1.6	Very poor soil. Part interplanted with Tonka Bean and Coffee in 1936 and 1937; interplanting to be continued in 1938.
B ...	1,486	149	137	34	40	1,846	6.0	34-39	12.85	2.1	Very poor soil. Part interplanted with Tonka Bean and Coffee in 1936 and 1937; interplanting to be continued in 1938.
18 A ...	2,722	251	161	148	90	3,372	8.5	14-40	21.73	2.5	Distance spacing experiment. One plot 10 ft. by 10 ft. trenched with pen-manure in 1937.
B ...	1,891	172	37	—	—	2,100	7.0	14-40	17.93	2.5	Whole field interplanted with Tonka Bean and Coffee in 1935, 1936 and 1937.
19 ...	1,101	101	66	10	70	1,348	4.5	29-40	16.57	3.6	Trenched with pen-manure 1934. About 1 acre cleared in 1937 and replanted with Criollo cocoa.
20 A ...	2,089	106	140	24	92	2,451	7.9	29-40	21.64	2.7	Light shade. Trenched with manure 1926. Fertilizer experiment from 1936.

COUNTING AND CROP RETURNS FOR THE YEAR 1937.—CONTINUED.

Field No.	Bearing Trees.	Half Trees.	Quarter Trees.	Supplies	Dead or missing	Total.	Acreage.	Approx. Age.	No. bags of 165 lb.	No. bags per acre.	Remarks.
B ...	1,361	26	38	63	69	1,557	5.1	29-40	19.70	3.8	No shade. Trenched with manure 1924. Fertilizer experiment from 1934. About ¾ acre of bad cocoa cut out and planted with King Oranges late 1937.
C ...	549	13	33	17	78	690	2.3	29-40	7.20	3.1	Shaded portion trenched with pen-manure 1936. Non-shaded portion cut out late 1937 and planted with Foster Grapefruit.
D ...	744	11	29	6	24	814	2.7	29-40	9.46	3.5	Shaded portion trenched with pen-manure 1936. Non-shaded portion cut out 1937 for replanting with Criollo Cocoa.
21 A ...	1,839	96	58	221	—	2,214	7.6	29-40	20.36	2.7	Partial shade. Trenched with manure 1931-32. Fertilizer experiment from 1934.
B ...	1,294	131	212	23	133	1,793	5.9	29-40	12.97	2.2	Partial shade. Trenched with manure 1931-32. Part fertilizer experiment from 1934.
22 A ...	1,576	29	166	161	197	2,129	6.6	29-40	25.39	3.8	Trenched with pen-manure 1935 and 1936.
B ...	2,442	142	288	113	279	3,264	10.2	29-40	30.36	2.9	Trenched with pen-manure 1936.
C ...	787	17	77	46	218	1,145	3.5	29-40	17.64	5.0	Trenched with pen-manure 1936.
D ...	1,504	107	55	49	134	1,849	6.0	29-40	9.66	1.6	About ½ of field trenched with pen-manure 1935.
E ...	1,050	10	30	3	123	1,216	3.8	29-40	3.41	.9	No special treatment. Heavy crop loss due to squirrels.
23 A ...	2,399	44	61	46	208	2,758	9.1	29-40	28.78	3.1	Trenched with manure 1934. Small fertilizer experiment from 1936.
B ...	804	38	56	228	90	1,216	4.4	29-40	10.52	2.4	Trenched with manure 1934-35.
C ...	1,330	39	61	320	438	2,188	7.5	29-40	15.72	2.1	Trenched with manure 1934-35.
24 ...	1,128	40	3	1	189	1,361	5.0	29-40	14.01	2.8	Whole field interplanted with T.1 Limes late 1935.
25 A ...	963	10	2	66	123	1,164	3.9	14-35	10.21	2.6	Mulch and Fertilizer experiment.
B ...	2,270	106	67	179	169	2,791	9.3	14-35	33.08	3.5	Propagation, Progeny and Colour Experiment plots. Propagation plots trenched with manure 1934 and fertilized in 1936 and 1937.
	84,967	5,495	5,957	7,326	8,386	112,131	397.1	—	1,011.65	2.55	

REPORT OF THE MANAGER, ST. AUGUSTINE NURSERY, 1937.

I was granted vacation leave from 22nd April to 9th November. Mr. E. J. Gregory, Manager, St. Augustine Experiment Station, carried out the duties of manager in my absence.

Plant distribution.

2. The total number of plants distributed in 1937 was 269,900 as against 102,347 in 1936, which shows an increased distribution in 1937 of 166,553. The greater part of this increase was due to the large number of cocoa seedlings raised for issue under the Cocoa Subsidy Scheme.

3. The distribution of decorative plants has increased rapidly in the past three years from approximately 8,500 in 1935 to 16,000 in 1937.

4. The free distribution of plants to Government Institutions has also risen from 3,782 in 1935 to 11,932 in 1937.

5. Since the raising of annual seedlings in boxes was started in 1936 there has been an increasing demand for these plants. The varieties grown are such plants as:—Zinnias, Petunias, Phlox; Verbena, Antirrhinums; &c. The number distributed in 1936 was 139 and in 1937, 508.

6. A detailed list of plants, seeds, cuttings, &c., is given below:

Citrus Budded.		
Grapefruit (Marsh)	7,505	
Do. (Assorted)	304	7,809
Oranges and other citrus	8,728	
T 1 Limes	266	16,803
Other Budded and Grafted Plants.		
Mangoes	1,744	
Avocados	1,359	
Cocoa	257	3,360
Seedlings.		
Limes, West Indian		10,730
Cocoa		210,872
Coffee		1,568
Miscellaneous Fruit Plants		4,405
Timber and Decorative trees		3,994
Other Economic Plants		885
Decorative Plants		16,283
Total number of plants distributed		268,900
Seedling Annuals in boxes	(boxes) 508	
Budwood (No. of Buds).		
T-1 lime buds	285	
Other citrus buds	23,529	23,814
Cuttings.		
Derris	91	
Other Cuttings	140	231
Seeds.		
Countable		137
Weight (lb.)		6
Miscellaneous (packets)		98
Produce.		
Limes (lb.)		8,465
Miscellaneous fruit		3,032
Vegetables		27
Miscellaneous.		
Prepared tape (yds.)		1,016
Leaf mould (bags)		65
Bamboo pots		34
Clay pots		63

Revenue.

The revenue for 1937 was $2,436.22 more than in 1936, the total amounts being $11,208.29 in 1937 as against $8,772.07 in 1936. There was grown for the Cocoa Subsidy Board from an amount of $3,400 provided by them, over 200,000 cocoa seedlings, 170,000 being distributed and the revenue from this—$4,250 is included in the total.

Heads.	$ c.
Grapefruit plants	1,683 00
Other budded and grafted plants	1,774 40
Other economic plants	5,650 96
Decorative plants	1,561 06
Produce	129 01
Miscellaneous	409 86
	11,208 29

Citrus.

The demand for grapefruit and orange plants continues. The orders received are still more than the resources of the nurseries can produce. Marsh grapefruit plants distributed was 7,505 as against 7,423 in 1936, which is an increase of 82 plants. The number of oranges distributed was 8,728 as against 6,935 in 1936, the greatest demand was for Valencia orange plants, the total being 1,793 more than in 1936.

The weather for lifting citrus plants from the open ground, June to December, was not favourable, spells of dry periods making the earth crumble when lifted in pelon.

Cocoa.

All cocoa plants grown at the nurseries this year were distributed through the Cocoa Subsidy Board, 30,000 being grown from an annual maintenance vote. An additional amount was provided by the Cocoa Subsidy Board to grow 170,000; this was done and 210,872 distributed.

Sour Orange Stock.

The weather was very bad between June and December for the planting out of sour orange stock Owing to our exposed situation here, unless a normal rainy season is experienced the plants do not establish themselves properly. In 1938, therefore, there will be less budded plants available owing to the lack of rain and the consequently later planting out of the stock, all the plants not having developed sufficiently to bud.

Scab (*Cladosporium citri*) was prevalent late in the year and destroyed the growing points of the sour orange still further retarding the development of the plants.

Limes.

The total number of lime plants distributed was 10,996. This includes 266 T 1, which is 478 less than in 1936. West Indian seedlings were 10,730.

Avocados.

The demand continues for budded varieties, 1,359 being distributed as against 1,709 in 1936.

Plants from fruiting avocado pear trees selected in 1935 by Dr. Wardlaw of the Imperial College, for cold storage tests, have been propagated from the following :—Pollock, St. Joseph 1, 2 and 3; Lenegan and Macqueripe 2. A plot has now been established at River Estate from where budwood is available. A consignment of these plants has been sent to the Department of Agriculture, Barbados.

Mangoes.

The number of grafted mangoes of all varieties distributed was 1,359 in 1937 as against 2,331 in 1936

WEATHER.

Less rainfall was recorded from January to May than in the previous year, viz., : 8.63 ins. against 10.86 in 1936, and less again from June to December, 52.71 ins. as against 60.22 ins. in 1936. The heavies rains fell in the months of August and September, 12.32 ins. and 11.95 ins. respectively; then in October 5.67 ins., November 7.32 ins. and December 5.05 ins.

ORCHARD PLOTS PLANTED FOR PROPAGATING MATERIAL IN 1931.

The one-acre plot of T 1 limes has been cut out with the exception of one bed containing 16 trees which has been left for future observation, and the land planted with sour orange stock.

Avocados.

Of the new varieties planted in 1933, Dunedin and Winslowson have died, these varieties will, however, be replaced as there are young plants available in the Nursery.

Mangoes.

All the varieties in this plot are established, with the exception of the Peach which died and which was replaced by the Buxton Spice. Another introduction has been the Grenada Ceylon.

Citrus.

The collection has been maintained and the following varieties introduced from Washington in 1929 and have fruited :—Sampson Tangelo, deep orange colour, seeded, acid; William Tangelo, whitish flesh seeded, slightly bitter flavour; Tangelolo, pink flesh, seeded, has carried a fair number of fruit this year.

Grape Vines.

The following varieties were introduced in 1936 and planted out in 1937 :—Vignes Gros Colman, Muscat d'Alexandrie, Parc de Versailles, Vignes Gradiska, Class elas dore, Lare de Versailles. They were pruned in October and a fair number of bunches developed, but these were destroyed in the young green stage by wasps biting the skin.

Trials.

The following introductions have been planted out :—*Balanites aegyptiaca, Homocladium Platycladium, Robinia Pseud-acacia, Combretum farinosum, Anona bullata, Schinus Molle, Schinus terebinthifolius, Calycophyllum Spruanum, Thespesia populnea, Tecoma velutina.*

Lima Beans.

The following varieties of Lima beans were introduced from Burma :—

Moki Lima	32-40
Do.	27-30
Pegya	6-4-37
Pebyugaley	6-4-37

The two best for vigour and cropping are Moki Lima, the other two under the same conditions appear to be less so.

General.

Aleurites (Tung oil).

Trees of *Aleurites Fordii* and A. Montana were planted in 1931, all of the Fordii died, but the Montana have grown into small trees and fruited for the first time in November and two pods were gathered.

Lonchocarpus sp.

This has been established in two varieties, viz.: white and black Haiari.

Bougainvillaea.

The seedlings grown in 1936 have all flowered and only one has been kept for further trial, the colour of which in the young bract is brick shading with age to a bright cerise.

Seedlings were raised this year from the following parent plants but not planted out:—

Name.	*No. of Plants.*
Mixed seedlings	29
Lady Watts	1
Pink	3
Brick	14
Lady Watts Seedling	31

Buildings.

An additional room was added to the northern end of the office.

Visits.

Rock River C.M. School, Tacarigua E.C. School.

Donors.

Seeds were received from the following:—The Ministry of Agriculture, Horticultural Section, Giza. Egypt; Royal Botanic Gardens, Kew; Thompson and Morgan, Ipswich, England; Economic Botanist, Burma; Vilmorin-Andrieux, France; Mrs. Hutchinson, Trinidad; Department of Agriculture, Darjeeling, Kalimpong, Bengal, India.

F. C. BUTHN,
Manager, St. Augustine Nursery.

REPORT OF THE MANAGER, ST. AUGUSTINE EXPERIMENT STATION, 1937.

From the end of April till the middle of November I was, in addition to my normal duties, acting Manager, St. Augustine Nursery, during the absence on leave of Mr. F. C. Buthn, the Manager.

2. In July an additional room was added to the existing office, and part of the boundary with the Southern Main Road was fenced with concrete posts and barbed wire.

Rainfall.

3. 1937 has been a year of normal total rainfall, although there were long dry periods during the months of July, August and September. A total of 55.72 inches was recorded which is close to the 19-year average for the Station (55.30).

Citrus Experimental Block.

4. Most of the trees in the experimental area are just five years old. Except for the cultural experiment which received no manure for the first three years, and certain plots in the manurial experiment, the trees have made excellent growth and have shaped up well. A very heavy trimming of low branches was carried out just before the rains began. In spite of this the trees have filled out again, and are cropping well.

Cultivation.

5. This has followed the usual practice of cutlassing and clean weeding under the trees. No circle forking was done in November as the trees are getting large and the roots extend for some distance beyond the spread of the branches.

Manures.

6. All trees other than those in the manurial experiment were given two applications of a mixture consisting of 4 lb. of Niciphos 1 and 3½ lb. of sulphate of potash (half the quantity at each application).

Pests and Diseases.

7. Scale insects both *Lepidosophes* and *Chionaspis* have been present, but they have not proved so serious this year. The presence of wind breaks of *Tephrosia candida* throughout the experimental area, has undoubtedly been of great benefit. Spraying was carried out once during the dry season, using a proprietary mixture. A certain amount of damage from burning was noticed on the young fruit, and spraying operations were discontinued.

8. Although scale insects have been checked, Rust Mite damage to the fruit is steadily increasing and has now reached serious proportions. Steps are being taken to attempt to control this serious pest.

Crop.

9. Approximately 500 crates of grapefruit and 60 crates of oranges were sent to the Packing Shed and realised the sum of $207.31. About 70 crates of grapefruit were packed and the rest culled.

Citrus Nursery.

10. A small nursery of stock plants has been maintained in order to replace any losses in the experimental area.

PROGRESS REPORT ON CITRUS EXPERIMENTS.

Experiment 5—Cultural.

11. The *Tephrosia candida* planted in the cover crop plots was supplemented by sowing a mixture of cover crop varieties in between the rows. Continued topping of the *Tephrosia* combined with the strong growth of weeds, has so much weakened its growth, that it is likely to disappear altogether. In spite of repeated efforts, no really successful semi-permanent cover crop has been found.

Experiment 6—Manurial.

12. The layout of this experiment was fully described in the 1936 report. Briefly it consists of a test of various combinations of organic and artificial fertilisers as suitable treatments for Marsh grapefruit, budded on to three stocks, sour orange, rough lemon, and "wild" grapefruit. Layout: 4 × 4 Latin square with four main, and four sub-treatments. At the beginning of the year, in consultation with Professor, F. Hardy, M.A. it was decided to increase the proportion of Potash by 50 per cent. in all treatments in which it occurred. Analysis of growth measurements and leaf sampling has shown that the effect of potash is most marked, but that the proportion of potash was probably not high enough to exert its full effect. The proportions of N : P : K which had previously been 1 : 4 : 1, were therefore increased to 1 : 4 : 1½, respectively.

13. The following table illustrates the results of the effect of the manures on growth, taking girth below bud as the standard measurement. It has been found that girth above bud gives almost identical results. It will be seen that N.1.+Pen.+P. still gives the greatest growth response, while the control plots have given the least response.

TOTAL AVERAGE INCREMENT OF GIRTH BELOW BUD, 1933-1937.
Three stocks combined. Mean of 36 trees (in cms.)

	Nil.	K.	P.	K+P.
N.1+Pen.	39.3	40.6	41.4	40.8
N.2	31.0	38.5	31.5	35.5
N.1	30.1	38.3	29.9	38.2
Nil	27.9	32.9	28.2	32.8

14. Fruiting records show much the same effect. No attempt was made to grade the fruit, which was naturally rather coarse, from such young trees. The total amount of fruit produced in each treatment is recorded in the following table.

YIELD OF FRUIT (MARSH), 1937.

Treatments.	Plots* Number.	Trees* Number.	Fruit Number.
Control...	3	4	40
K.	4	16	102
P.	3	7	65
K.+P.	4	20	123
N.1	2	3	38
N.1+K.	4	29	356
N.1+P.	4	7	45
N.1+K.+P.	4	29	568
N.2.	4	6	25
N.2+K.	4	25	494
N.2+P.	3	3	8
N.2+K.+P.	4	22	422
N.1+Pen.	4	30	1,403
N.1+Pen.+K.	4	35	1,478
N.1+Pen.+P.	4	35	1,473
N.1+Pen.+K.+P.	4	34	1,571

* Plots, Maximum 4. * Trees, Maximum 36.

15. The figures clearly show the influence of potash on fruiting. In every treatment where potash appears, not only is the number of fruit increased, but the number of bearing trees is increased considerably. In the pen manure treatments fruiting is nearly four times as much as in those treatments without pen manure. The trees are still too young to draw any definite conclusions.

Other Experiments.

16. It is hoped in the near future to publish separately a progress report on all these experiments when other experiments will be dealt with.

Additional Experiments.

17. *Time of application of manures.*—Early in the year an experiment to find the best time of application of Nitrogen and Potash was laid down on certain of the guard row trees in the manurial experiment. The treatments consist of:—

1. Manures applied in May.
2. Manures applied in January and May.
3. Manures applied in March and May.
4. Manures applied in May and September.
5. Control.

Each plot consists of 16 trees, 8 Marsh, 4 Foster and 4 Duncan, on sour orange stock and laid out in the form of a 4 × 5 randomised plot. Phosphates were applied in March and 4 lb. of sulphate of potash plus 2 lb. of sulphate of ammonia were applied for the year, according to the number of applications. In order that this experiment should not in anyway interfere with the manurial experiment, trenches were dug between the guard rows and the plots, so that each plot was completely isolated.

Vegetative Propagation of Citrus.

18. Early in the year an attempt was made to produce sour orange stocks by vegetative propagation, using the field technique of "Layering" adopted at East Malling Research Station, for the rapid production of apple stocks. The method adopted followed closely the East Malling technique, except that the young shoots were wired to induce root growth. It has been found by research workers that sour orange layers will not readily root, unless some artificial stimulation is adopted.

19. Twenty-five selected strong growing sour orange seedlings were planted on the 3rd December, 1936, in two rows at about 3 ft. apart in the rows, and inserted in the ground at an angle of 30 degrees. The seedlings were about 2½ ft. high at time of planting. As soon as these were established (17.12.36) the plants were pegged down flat on the ground, the growing point cut off, and side shoots induced to grow. As soon as these shoots were about 6-8 inches high (25.1.37) a fine copper wire was tied round them at the junction of the shoot to the main stem, care being taken not to damage the bark. They were then covered with earth to a depth of a few inches, and subsequently moulded further when necessary. By March roots were beginning to appear and by the end of April, vigorous rooting had taken place. In the middle of May the young plants were removed from the mother plant, and were planted out in nursery beds for budding later. The number of plants from each layer varied from three to five, and ranged in height from 2-3 ft. Some of the plants were budded in September, but it will not be possible to plant them out till 1938. It was found afterwards that many of the shoots which were not wired had also rooted, although these were naturally much later than the wired plants.

20. This experiment was in the nature of a preliminary investigation, and although it has been definitely proved that vegetative stocks can be raised rapidly in this way, considerable improvements in technique would be necessary to make this a practical way of producing vegetative plants. Shoots should be wired in the early stages of growth but should definitely be removed from the mother plant before becoming too big. If left on the mother plant too long they develop so strongly that the vitality of the mother plant is used up and further shoots may not develop. If taken off early a much greater number of identical plants could be raised.

Yearly Costs of Citrus Cultivation.

21. The total cost of all citrus experiments during 1937 is given below, in comparison with those of 1936. These figures do not include capital charges or management costs.

Total Cost of Citrus Cultivation—1937.

	1936.	1937.
	$ c.	$ c.
Drain	129 13	34 72
Cutlass	341 43	392 52
Weed	—	39 70
Rondear	184 53	242 47
Circle fork	59 33	—
Mulch	67 09	17 97
Fertilisers	423 97	401 05
Pen Manure	52 62	51 71
Spraying	131 52	11 07
Supply plants	—	3 16
Windbelts	9 30	35 87
Prune trees	50 89	177 73
Expt. 5—Cultural	194 32	174 74
Records	199 96	108 22
Weed drains	44 10	34 32
Lime wash trees	18 12	21 63
Reap fruit	26 77	92 09
Roundridge (Expt. 3)	—	13 15
Miscellaneous	33 74	11 79
Total	1,966 82	1,863 91

22. It will be seen that there has been a reduction of $102.91 compared with the 1936 costs. There are 47.12 acres of citrus under cultivation at present, which gives an average cost of $39.56 per acre, excluding capital charges and management.

LIMES.

Backcrosses.

23. Most of the backcrosses in Field 16 (from the 1933 crosses) have been cut out as unsuitable for further consideration. There are about ten left which may be used for further breeding work. The 1936 crosses have been planted out, and have made good growth.

24. During June further crosses were attempted between T 1., T. 145, Woglum, and Tahiti, with the West Indian Lime, crossing both ways. Adverse weather conditions caused a great many of the pollinated flowers to drop, and the only crosses obtained were with Woglum (male) and West Indian (female). The attempt to cross West Indian with Tahiti failed as Tahiti which is seedless, is apparently at least partially male and female sterile. About 70 seedlings are now growing in boxes.

Juice Testing.

25. The juice test of T 1. and West Indian limes, which was started in June, 1936, was completed by June, 1937. The object was to test the juiciness of green T 1. limes as compared with West Indian limes, throughout a complete year. At weekly intervals during that time samples of green T. 1. and West Indian limes, were squeezed, and the volume and weight of juice produced, measured. The amount by weight of juice to green fruit was calculated as a percentage.

26. For simplicity the weekly figures have been averaged for each period of four weeks. The following table shows the results obtained.

1936–1937.	Percentage by weight of Juice to Fruit.	
	West Indian.	T 1.
June 18 to July 9	42.3	34.5
July 16 to Aug. 6	40.4	29.2
Aug 13 to Sept. 3	28.4	28.3
Sept. 10 to Oct. 1	27.1	26.7
Oct . 8 to Oct. 29	28.0	27.4
Nov. 5 to Nov. 26	24.9	25.0
Dec. 3 to Dec. 24	23.3	27.8
Dec. 31 to Jan. 21	26.7	29.2
Jan. 28 to Feb. 18	30.2	27.3
Feb. 25 to March 18	31.2	30.6
March 25 to April 15	29.8	30.8
April 22 to May 13	24.5	31.0
May 20 to June 10	36.0	32.1

27. It can be seen that although the West Indian lime fluctuates considerably in juice content as the tree follows the normal cycle of blossom, green fruit, and ripe fruit (23.3 per cent. lowest to 42.3 per cent. highest), the T 1. lime although less juicy, does not fluctuate so much, having a more evenly distributed fruiting period (25.0 per cent. lowest to 34.5 per cent. highest). At all times during the year it was possible to get an appreciable amount of juice from the T 1. lime. It is therefore likely that the chief reason for the complaint that T 1. limes were not juicy is largely a matter of insufficient care in selection in the field, although it is possible that environment may be an additional factor.

District Citrus Manurial Experiments.

28. During 1937 five new experiments were laid down on various estates, and one experiment at Arima was abandoned. These experiments are :—

1. Macqueripe, Lagoon Piece ...Time of application of Phosphate.
2. Macqueripe, Juan Field ....Complete fertilisers and limestone.
3. Torrecilla, Arima ... ...Interaction of Potash and ground limestone.
4. El Reposo, Sangre Grande ...Interaction of Phosphate and limestone in the presence of Potash.
5. San Antonio, Santa Cruz ...Time of application of manures.

29. Of the eight experiments at Santa Cruz, Tamana, Maracas, McBean, Macqueripe, and Erin, laid down in 1936, in most cases the trees are just coming into bearing, and it is too early to interpret the available data.

SUGAR CANE.

Multiplication and Distribution of New Varieties.

30. Further supplies of the cane varieties sent out in 1936 were distributed to estates for further multiplication and variety trials. Six new varieties were released from St. Augustine to various estates ; B. 3013, B. 3124, B. 3127, B. 3138, B. 3439, and P.R. 803.

31. Ten new varieties were released from the Quarantine Station, for multiplication at St. Augustine ; B. 34104, B. 34117, B, 34163, Co. 313, Co. 421, Co. 419, C.P. 28-11, C.P. 28-19, N.G. 251, and F. 31/248.

Cane Crop.

32. Two hundred and two tons of cane were reaped and sent to Orange Grove factory. The crop realised $550.31. The old cane varieties in Field 19 were stumped out and a cover crop of Bengal beans planted.

MINOR CROPS.

Pigeon Peas.

33. Eight plots of selected pigeon peas were planted in Field 17. These consisted of seeds from the heaviest bearing plants of the 1936 crop, four beds of the Lasiba type, and four beds of the Tobago type. Heavy rains at the time of germination and during early growth accounted for heavy losses and certain plots had to be heavily supplied.

34. Fifty plants in each plot were selected at random, in order to obtain the average weight of dried peas. Unfortunately a good many of the selected plants lodged, and could not be used. Finally 35 plants in each Lasiba plot, and 40 plants in each Tobago plot were reaped and the yields recorded. These plants yielded an average of 9.2 oz. of dried peas per plant. As many plants had fallen, a portion of the crop was disposed of as green peas. These amounted to 500 lb. Total weight of dried peas reaped amounted to 727 lb. for 1½ acres, or 484 lb. per acre. From a field count it was recorded that 41 per cent. of the available plants were dead. The peas therefore gave a theoretical yield of 820 lb. per acre, of dried peas.

35. There is no doubt that these peas are popular with the peasant population. As green peas there is a steady demand, as they are considered superior to the usual market product. There was also a heavy demand for seed for planting in the rainy season.

Cover Crops.

36. Small plots of the available cover crops were reaped in February, and further plots planted, to keep up a small supply of seed.

Cassava.

37. The following varieties were grown and kept for stock :—

Bitter cassava : Sellier, Parasol, Turkey Claw and Maman l'Enfant.
Sweet cassava : White stick, Black stick.

Dhal.

38. Several samples of "Arhar Dhal" were made for experimental purposes. Two processes can be used, either by "parching" or "soaking". The peas used were our selected pigeon peas. Excellent samples were produced, and the local peasants were of the opinion that they compare very favourably with the imported article. The product has interesting possibilities, as our local peas are considerably better than the mixture of peas found in imported dhal.

39. At the same time a collection of peas, suitable for dhal making, were received from India, and these are being multiplied for further use.

Maize.

40. Efforts are being made to improve the quality of seed used for maize planting. With this object in view plots of maize were planted at St. Augustine during October, to attempt by mass selection methods, to produce a better and more uniform seed corn.

41. Three excellent samples were obtained from the I.C.T.A. farm, where selection work has been carried out for some years. Two other samples were collected from maize growing in the field, one from the Princes Town district, and one local sample. Cobs were selected for the usual field characters, and they will be planted on the "ear to row" system.

Papaws.

42. About one acre of selected varieties of papaw were planted in the citrus grove, the varieties being :—Mexican, Porto Rican, local long, and local round. They have grown well without any signs of disease, but there has been the usual high percentage of males.

Melons.

43. A further trial ot melon varieties was planted during November. There are about ten varieties including four received from the Department of Agriculture, Barbados, which have shown excellent results under their conditions. The plants have made good growth, but many have been affected by mildew. This has been partly controlled by sulphur dusting.

GENERAL.

Gravel Roads.

44. Towards the end of the year, a portion of the grass trace between Fields 12 and 13, was laid with boulders and gravel. Nearly seven chains of gravelled road were completed.

Alteration in Labour Rates.

45. As a result of the disturbances of June, 1937, the labour rates have been increased from 40 to 45 cents per day for men, and from 30 to 35 cents per day for women. Task rates have been increased by 5 cents, without alteration in the size of the task.

St. Augustine Rice Lands.

46. The 13 acres comprising the St. Augustine rice lands were again rented to the same tenants. A main drain along the roadside was cleaned, but there are still complaints of poor irrigation. The whole area suffers considerably from a lack of a sound irrigation scheme. As so much of the surrounding land belongs to many different owners, it is difficult to get concerted action in the matter.

REVENUE—1937.

	$ c.
Cane and cane plants	550 31
Grapefruit	213 69
Oranges	76 11
Cover Crops	12 58
Miscellaneous	171 17
Total	1,023 86

EXPENDITURE—1937.

	Expenditure. $ c.	*Savings.* $ c.	*Total Vote.* $ c.
Personal Emoluments	3,984 00	—	3,984 00
Maintenance and Materials	2,952 14	4 86	2,957 00
Cultivation	4,599 68	473 32	5,073 00
Stock	622 23	1 77	624 00
EXTRAORDINARY :			
Sizing machine	—	480 00	480 00
Total	12,158 05	959 95	13,118 00

E. J. GREGORY,
Manager.

REPORT OF THE CURATOR, ROYAL BOTANIC GARDENS, 1937.

Royal Botanic Gardens, Government House Grounds, St. Clair, Queen's Park, St. Ann's and Mendez Savannahs, Red House and Audit Office Grounds.

ROYAL BOTANIC GARDENS.

I regret to record the death on the 17th October, 1937, of the Overseer, Mr. Edward Beharry. Mr. Beharry had served in the Department for 12 years.

Maintenance.

2. The year 1937 was characterized as being a particularly difficult one for the new planting schemes undertaken, and in consequence replacements were numerous, and resultant growth was poor. The rainfall for the year amounted to 58.00 inches, of which 19.96 inches fell during the months of November and December. During the last two months of the year the rainfall was considerably above average, and minor floodings occurred in the lower parts of the Gardens.

3. Special attention has been devoted to the maintenance of the lawns, additional areas have been levelled and prepared. A much larger area of grass is now being closely mown than was the case in previous years.

4. Mole crickets and Chinch bugs caused little or no trouble until the end of the year, when they became numerous. Control work commenced as soon as they appeared, with good results. The mole cricket damage was effectively checked by repeated applications of diluted household disinfectant (5½ fluid ounces to 12½ gallons of water), followed by a flooding of the ground with water. By this method the insects were forced to the surface and destroyed. The area of ground treated each day is relatively small and costly and is not one to be recommended on large areas of infestation. Chinch bug damage was found to be particularly severe on the more closely mown sections. The infected areas were first treated with a Diesel Oil Emulsion, applied by means of a watering can at the strength of 1 part to 40 parts of water. More effective results were obtained by forcing the solution through a compressed air pump. Java grass (*Polytrias praemorsa*) continues to be somewhat affected by mole crickets and under lawn conditions, it is not altogether satisfactory and serviceable as a turf.

5. The low rainfall for the year caused the untimely death of two more nutmeg trees in the ravine these together with a specimen of Jamaica Walnut (*Picraena excelsa*) and *Thuya occidentalis* were felled and removed.

6. The condition of many of the older specimen trees gives no undue cause for alarm, constant trimming and the removal of cases of ' die back ' were necessary to maintain them to a reasonable standard of safety.

7. As a result of the general labour disturbances, an increase in the daily wage of the Garden labourers was effected as from the 21st June, 1937.

8. The *Dendrocalamus Balcoa* clump in the northern section of the Gardens provided the rare occasion for this genus to flower. As is always the case with Bamboos, this was the " death knell " and the clump ultimately died and was removed. Several sheets of herbarium material were prepared and were presented to Kew.

9. Large sections of the principal roads were repaired and resurfaced, and in view of the unsatisfactory surfaces of the gravel roads in the Gardens, this recurrent expenditure would be minimised if a surface of " Colas," or a similar preparation could gradually be introduced where the damage caused by the heavy rains is most severe.

10. Due to the Gardens being more and more frequented by visitors it was found necessary to provide twelve additional garden seats. For the convenience of visitors a notice board has been erected near the main entrance gate and provides useful information regarding items of seasonal interest.

11. To commemorate the occasion of the Coronation of Their Majesties, King George VI and Queen Elizabeth, a plant of *Amherstia nobilis* was planted by His Excellency Sir Murchison Fletcher, K.C.M.G., C.B.E. During the Coronation Celebrations on this occasion the arch-way leading to Government House was decorated and flood-lit, and decorative lighting and flood-lighting of the Flower Garden and Government House was carried out by the Public Works Department.

Government House Grounds.

12. The Gardens surrounding His Excellency the Governor's Residence have been well maintained with a continuous display of flowers throughout the year. Numerous alterations and improvements to the layout of the Gardens were effected with the result that more colour has been introduced.

13. A new bamboo hedge of *Bambusa nana* has been planted and will eventually replace the existing *Acalypha* hedge on the eastern boundary. The overgrown border of *Bougainvillea spectabilis* var. Mrs. Butt, has been removed and other plants of a more compact nature such as standard *Hibiscus*, *Cannas*, *Clerodendron*, and *Codiaeums* were planted.

14. On the northern section of the grounds various changes have been completed. A large shrub border has been prepared and planted with subjects for colour foliage effects. The *Murraya exotica* hedges to the east and west of the Lady Chancellor's Garden were removed to give a greater emphasis to the approach to Government House.

15. Many varieties of vegetables were grown in the vegetable garden and several new types were introduced, notable amongst which was the trial bed of vegetable *asparagus* prepared in August, this crop has proved most adaptable to local conditions. A trial sowing of Bean " *Pois Madame* " from seed introduced from Grenada compared favourably with specially selected varieties imported from England.

ROYAL BOTANIC GARDENS AND QUEEN'S PARK SAVANNAH IMPROVEMENTS.

16. During the year a scheme was prepared and approved for the development and extension of the cultivated sections of the Gardens, and for the planting of ornamental beds in the Queen's Park Savannah, combined with extensive alterations to the north-west corner of the Savannah. The work undertaken is detailed below.

17. In the Gardens the section to the north-east and south-west of the ' Lookout ' is now included in the cultivated section of the Garden. Some twenty acres in all have been partially felled and allowed to develop as grass slopes, and conspicuous groups of Bougainvillea have been planted. The Avenue of *Cassia fistula* trees has recently been extended to the ' Folly,' and with the widening of the narrow pathway, this section of the Gardens has been greatly improved and has now become a centre of attraction to visitors. Two wooden bridges, constructed with local woods, now span the main ravine and lead by a graded and winding pathway to the Lookout Hill.

18. The construction of the water-lily pond at the southern end of the Emperor Valley was carried out by the Public Works Department, to an informal design in keeping with the adjacent surroundings. By graduation of the depth of water from 2 ft. 6 ins. to 5 ft. accommodation have been provided for the cultivation of the majority of tropical aquatic plants. The Government House swimming bath has been converted solely for the use as a propagation tank for aquatic plants.

19. Repairs and the painting of the fence on the south-western boundary of the Gardens was undertaken by the Public Works Department, together with the construction of suitable drains leading away from the Palm walk.

Queen's Park Savannah.

20. In the north-west sunken corner a rock garden has been constructed utilizing some 250 tons of weathered Guaratal stone collected from the heights of Maraval and Santa Cruz. Various types of flowering annuals and low growing shrubs have been planted. Prominent amongst which, has been the colourful displays of the *Amaranthus rubra* and the Jamaica fever plant (*Tribulis cistioides*). It is proposed to devote one of the rock garden sections entirely to indigenous cacti and succulents.

21. Two water lily ponds of an irregular design were also constructed in this hollow by the Public Works Department, and are connected by means of an underground pipe line with the pond in the Royal Botanic Gardens in order to provide water for refilling when necessary.

22. A winding four feet wide pathway leading from the Savannah walk has been laid down to give access to the ponds and the rock garden. The existing culvert has been spanned by two rustic bridges constructed with local hardwoods.

23. Around the perimeter of the Savannah thirty flower beds were prepared and planted with flowering shrubs. It is the intention to plant these in future, mainly with *Bougainvillea spectabilis*, vars. Mrs. Helen McLean and Mrs. Butt.

GROUNDS TO GOVERNMENT BUILDINGS, PORT-OF-SPAIN.

24. A large programme of improvements to the grounds of Government buildings in Port-of-Spain was sanctioned by Government in June; a fair proportion of the work approved has been completed but some work still remains to be carried out during 1938.

25. The grounds surrounding the Red House, Audit Office, and District Magistrate's Court have been well maintained and the lawn regularly mown. Certain improvements were made under the improvements to Government Buildings Scheme and are detailed below.

26. *Audit Office.*—The Hibiscus hedge and the iron fencing on the south side have been removed. The fence has been replaced by a retaining wall two feet in height in keeping with the surroundings to the Red House, and backed by a low hedge of *Barleria cristata.* The grass plots to the front and back of the buildings have been levelled and turfed.

27. *District Magistrate's Court.*—The ground to the north has been levelled with transported soil and turfed. A fifteen feet wide roadway was constructed to allow the entry of the prison van and impounded carts, &c.

28. *Government Printing Office.*—The waste ground on the western and southern sides were levelled and laid down as a lawn. A total distance of one hundred and seventy yards of hedges were planted on the boundaries.

29. *Wireless and Telegraph Office.*—The overgrown hedges surrounding this office have been removed and replaced with *Malvaviscus arboreus,* as soil conditions here were found to be unsuitable for the cultivation of Hibiscus. The lawns around the building were renovated and sections returfed.

30. *Health Office, Woodbrook.*—The area on the western and northern boundaries were levelled and turfed, and enclosed by hedges of *Malvaviscus arboreus.* These grounds are now maintained by a part-time gardener employed by the Department for two days each week.

31. *Tranquillity School.*—The hedges on the eastern boundary were renovated and in some cases wholly replanted. The playground of the Boys' Department has been levelled and these areas returfed. Neglected hedges were pruned hard back to encourage new clean growth. A new hedge was planted to divide the Boys' and Girls' Departments. It is the intention on establishment of the hedge, to remove the existing corrugated iron fencing. Thirty-six flowering shrubs were planted in groups throughout the grounds of both Departments.

32. *Colonial Hospital and Bacteriological Laboratory Grounds.*—The main lawn has been renovated and depressions filled and turfed. Numerous flower beds and shrubs were removed to allow a free sweep of lawn. Overgrown hedges were removed and replanted with *Eranthemum Eldorado* at the (*a*) Western boundary, (*b*) Medical Superintendent's Quarters, (*c*) Tennis Court Section, (*d*) Matron's Quarters, (*e*) Resident Doctors' Quarters and (*f*) Laboratory Section. A piece of ground was levelled and turfed adjacent to the children's ward as a playground. General cutlassing and cleaning of the remaining grounds at the back of the buildings was given.

33. *Fire Brigade and Constabulary Station, Woodbrook.*—New hedges of *Murraya exotica* and *Hibiscus rosea-sinensis* have been planted on the western boundary and to form a screen to the living quarters of the Fire Station. The ground surrounding the Fire Station and to the front of the Constabulary Station, was levelled and planted with grass.

34. *Eastern Boys' and Girls' School.*—Hedges of Governor Plum (*Flacourtia Ramonchii*) were planted on the southern and western boundaries; a similar hedge has been provided to screen the Caretaker's Quarters.

35. *House of Refuge.*—The two large circular shrub borders on either side of the main entrance have been prepared and replanted with ornamental shrubs. Fourteen palms in concrete pots were also provided.

36. *Auditor's Quarters.*—The existing hedges of *Aralia* were continued to enclose the garden. Sections of the garden were levelled and laid down as lawn.

37. 31, *Alexandra Street.*—A double hedge of Barbados Pride (*Caesalpinia pulcherrima*) and sweet lime (*Murraya exotica*) has been planted. This temporary hedge of Caesalpinia was provided to afford a screen from the main street.

38. *Watchman's Huts, Queen's Park Savannah.*—Old neglected hedges were removed and replanted with *Murraya exotica.*

39. Palms in concrete pots were also provided for the following Government Institutions:—

Harbour Master's Office.
Customs House.
Royal Gaol.
Mental Hospital
St. James Barracks.

General.

40. *St. Clair and Head Office Grounds.*—The grounds surrounding the Head Office of the Department have been regularly maintained. The avenues of trees planted on each side of the road have made reasonable growth. It is to be regretted that the trees planted along the other new streets of the St. Clair lots were wantonly damaged, and a certain amount of unevenness in growth has resulted.

41. *Trees on Government Lands, Port-of-Spain.*—Periodical attention was given to trees on lands under the control of the Department, and regular tree cutters are now employed solely for this purpose. Trees on the following lands under the control of the Public Works Department also received attention :—

Tranquillity Schools.
Eastern Schools.
St. James Barracks.
Queen's Royal College.
Colonial Hospital.
Fire Brigade Head Quarters.
Girls' Industrial School.
Government Printing Office.
St. Ann's Mental Hospital.

42. The San Fernando Borough Council approached this Department with a view to effecting improvements to the Skinner Park Recreation Ground. A scheme of ornamental tree planting was drawn up and I personally supervised the planting. A numerical labelling system was introduced for easy reference.

43. The Royal Botanic Gardens' Guide Book was revised, and a revised edition published by the Government Printer. The new publication gives details of the recent major improvements and includes sixteen half plate sized photographs with a suggested itinerary for a tour of the Gardens.

44. The Orchid House Collection benefited considerably by the botanical excursions made to the local forests. Amongst the many indigenous orchids found was the rare natural hybrid *Oncidium hoematochilum* (*O. lanceanum* (*female*) x *O. luridum* (*male*)). *Dendrobiun mobile* was recorded in the Royal Botanic Gardens as having produced flowers for the first time in this colony.

45. The mutual exchange of orchid plants between collectors abroad continues and has for the year under review resulted in the acquisition of several new and noteworthy species. In the majority of cases all have proved satisfactory under local conditions.

46. In co-operation with the Horticultural Club a collection of native plants was forwarded for exhibition at the Empire Exhibit, Chelsea Flower Show, London. A favourable report was received, although had there been more time for their collection a more representative collection could have been forwarded.

47. Thanks are gratefully accorded to the following Institutions and persons for gifts of plant material :—

Abroad—Horticultural Section, Gizah, Egypt.
Royal Botanic Gardens, Kew, England.
Royal Botanic Gardens, Peradeniya, Ceylon.
Botanic Gardens, Balboa, P.C. Zone.
Royal Horticultural Society, London.
United States Department of Agriculture, Washington, D.C.
Department of Agriculture, Mayaguez, Puerto Rico.
Messrs. Vilmorin-Andrieux, Paris, France.
Mrs. K. Perenchief, Bermuda.
H. W. Smith, Esq , Tahiti Society Islands.
F. G. Sheldon, Esq., Surrey, England.
David Barry, Esq., Los Angeles, U.S.A.
Mrs. Langlois, Nassau, Bermuda.

Local—Sir George F. Huggins, O.B.E., Port-of-Spain.
Mrs. McShine, Port-of-Spain.
Captain I. Knights, Port-of-Spain.
W. R. Dickson, Esq., Port-of-Spain.
F. Carr, Esq., Caparo.

R. E. DEAN,
Curator, Royal Botanic Gardens.

GOVERNMENT STOCK FARM, TRINIDAD—1937.

General.

Staff.

Dr. J. L. Shannon, Assistant Officer-in-Charge, Government Farm, was granted leave as follows during the year :—

22nd—30th June (Casual leave)
15th—31st December (Vacation leave)

Dr. Shannon's duties were carried out departmentally. Mr. J. H. Brooks (Clerk) proceeded to England on leave from 5th July, 1937 to 28th October, 1937, and during his absence Mr. P. J. Dominique (Store-keeper) carried out his duties.

Encouragement of Livestock Rearing.

2. With a view to encouraging the rearing of livestock more generally in the colony, especially among the peasantry, the Animal Husbandry Committee of the Agricultural Society submitted a report at the request of Government early in the year, in which the chief recommendations were :—

(*a*) The appointment of a Livestock Officer.
(*b*) The use of itinerant breeding units throughout Trinidad.
(*c*) The stationing of more stud animals at suitable centres in the island-ward : the livestock work in Tobago to form part of the duties of the newly appointed veterinary surgeon there.

Itinerant Breeding Units.

3. Steps were taken immediately to put these suggestions, as far as possible, into operation, and two itinerant breeding units, each consisting of a Jack Donkey for mule and donkey breeding, a pure bred Holstein Friesian Bull, a British Alpine Buck Goat, and wherever required a boar pig and a thoroughbred stallion, were sent to the following districts during the year, operating in each area for two months. Posters advertising the stud animals were put up in each area, showing the new scale of fees to be charged.

Animals Served.

District.	Horsekind (mares to stallions.)	Mule Breeding (mares to Jacks.)	Jenny Donkeys.	Cows.	Goats.	Sows.
Cedros. (Ste. Marie Estate)	4	4	19	7	9	—
Arima. (The Paddock of the Race Course)	—	1	1	3	1	—
Union Park. (The Paddock of the Racé Course)	4	5	—	1	8	—
Princes Town Area. (Craignish and Hindustan Estates)	—	2	1	2	—	3
Chaguanas. (Mes Voeux Estate and Caroni Savannah Road) ...	—	6	5	7	—	—
Toco District. (Salybia, Galera and Anandale Estates) ...	—	4	4	6	—	3
Penal. (Mr. Ramnarine)	—	8	11	8	2	—
Sangre Grande. (Ste. Marie Estate)	—	3	—	6	—	3
	8	33	41	40	20	9

4. Besides the breeding units, a number of stud animals were stationed in districts under the care of private individuals or estates during the year for the benefit of the district :—

Arima	...Mr. Andre Cipriani	...Buck Goat	...April-June.
Brasso	...Mr. Croney	...Buck Goat	...January-June.
Manzanilla	Mr. R. J. Kernahan	...Buck Goat	...January-February.
Chaguanas	...Mr. F. Penco	...Murrah Water Buffalo Bull	...May-September.
Chaguanas	...Woodford Lodge Estate	Murrah Water Buffalo Bull	December.
Curepe	...Mr. Barban	...Grade Holstein Bull	...November-December.
Santa Cruz	...Mr. Harrisson	...Berkshire Boar	...January-July.

5. Arrangements have been made for increasing the number of itinerant breeding units in Trinidad to four instead of two for 1938, and to extend the stay in each district from two to three months. The final step in this direction will be the standing of suitable sires permanently in the various districts in the colony throughout the year.

Transfer of Stud Animals in Tobago.

6. The following animals from this institution were transferred to the Tobago Farm during the year for increasing the breeding work in out-districts in the island-ward :—

1 pure bred Sussex Bull.

1 grade Sussex Bull.

1 Zebu Foundation Bull.

3 pure bred British Alpine Buck goats.

2 grade British Alpine Buck does.

1 pure bred Blackhead Persian Ram Sheep.

2 pure bred Large Black boar pigs.

Livestock Exhibition.

7. The Agricultural Society organised another Livestock Exhibition at the Race Stand and Paddock on the Queen's Park Savannah during the year from the 15th to the 17th October, and the Farm was allotted a small section on the ground for its exhibits, which were not for competition.

8. The following were the livestock from the Government Stock Farm at the Stock Show :—

Horsekind.

2 Thoroughbred stallions (Young Native and Knight of St. Patrick).
1 Kentucky Jack Donkey (used for mule and donkey breeding).
1 Kentucky Jenny Donkey.

Cattle.

The pure bred Holstein Friesian Bull "Sir Inka May 45th" imported from the Carnation Farm, Seattle, Washington (1935).
The pure bred Holstein Friesian Bull (British Friesian) "Lund Superblanche Julius 2" presented to the Trinidad Government by Mr. C. W. H. Glossop from his "Lund" Herd of British Friesians (1936).
Pure Bred Sussex Bull, Cow and Bull Calf.
Pure Bred Zebu Bull and Cow.
A Murrah Water Buffalo Bull (Brown), Cow and Bull Calf.

Goats.

British Alpine Goats (dairy breed).
Indian Goats (mutton breed).

Sheep.

Blackhead Persian Sheep.

Pigs.

A Boar and a Sow of Large Blacks and Berkshires.

Poultry.

A trio of Rhode Island Reds, Barred Plymouth Rocks and White Leghorns.

9. There was a good attendance at the Show for the three days, and the holding of a Sale on the second day was a step in the right direction.

10. The Assistant Officer-in-Charge, Government Farm, was relieved from his ordinary duties and travelled to outlying country districts to encourage owners of livestock to show their animals.

Cattle.

Importation of Murrah Water Buffaloes.

11. The Murrah Water Buffaloes ordered from India through the Imperial Agriculturist, Mr. Wynne Sayer, Pusa, 8 bulls and 7 cows or heifers, for the Sugar Estates and the Stock Farm sailed from Calcutta on the 1st December, 1936, and arrived in the Colony on the 21st January, 1937. Five of the cows and heifers calved bulls during the voyage and the others were heavy in calf : they were all landed safely, and were then placed in quarantine for two months before handing them over to their respective owners.

12. Two of each sex had been specially selected for Government on account of their high milking qualities and were retained at the Farm. These animals are now kept with the young dairy Zebu stock tethered under trees in a coconut grove, and are handled daily making them most docile. The landed cost of the Buffaloes for the Farm was $1,168.12.

13. The two bull calves were well grown at the end of the year, and were offered for sale at the Annual Sale of Livestock in December :—

	Purchaser.	*Price Paid.*
Bull Calf (from heifer)	...Mr. George de Nobriga	... $258 00
Bull Calf (from cow)	...Ste. Madeleine Sugar Co. Ltd.	... 240 00

The older bull (black) was rented to Mr. Penco of Longdenville (Cane farmer) at $8.00 per month from May to September and to Woodford Lodge Estate in December. As the two cows were settled down in calf at the close of the year, arrangements have been made to rent the bulls out to Sugar Estates and Cane-Farmers in 1938.

Registration.

14. The following animals born since our last registration in the Herd Book of the Agricultural Society were registered during the year :—

Pure Bred Holstein Bulls	5
Pure Bred Holstein heifer calves	1
Pure Bred Zebu heifers	3
Zebu Foundation Bulls	4
Zebu Foundation heifers	4
Pure Bred Sussex Bulls	1
Grade Sussex Bulls	2
Grade Sussex heifers	3
Grade Holstein Bulls	3
Grade Holstein heifers	17
	43

Sir Inka May 45th.

15. The pure bred imported Holstein Bull "Sir Inka May 45th" (June 1935), from June, 1936 to the end of the year was mated to the following animals—all on the strength of the Farm :—

Pure Bred Cows.	*Pure Bred Heifers.*	*Grade Cows.*	*Grade Heifers.*
2	4	30	19

During the year 11 grade calves by this bull were born (7 bulls and 4 heifers) : three of the bull calves were sold for rearing in outlying districts, one bull calf and two heifer calves died, and the remaining three bull calves and two heifer calves are still on the strength. Several cows and heifers including pure breds will calve down for this bull early next year.

Lund Superblanche Julius 2.

16. The fertility of the British Friesian Bull "Lund Superblanche Julius 2" (March, 1936) was tested in May, 1937, and during the year he was bred to the following animals:-

Government Farm Animals.		*Outside Animals.*	
Grade Cows.	*Grade heifers.*	*Grade cows.*	*Grade heifers.*
14	6	10	2

His first crop of calves are expected in February, 1938. He has developed beautifully, and like the Carnation Bull (Sir Inka May 45th) he is now thoroughly acclimatised.

Importation of Friesian Holsteins from Canada.

17. The following young pure bred Holstein Bulls, selected by Mr. C. A. Archibald (late) of Cattle Division Department of Agriculture in Canada were landed in the colony on 30th September, 1937, in good condition: these bulls will be used in the breeding work in outlying districts:—

Name of Bull.	*Date of Birth.*
King Rocharm	...22nd July, 1936.
Llynvenith Kerk	...24th September, 1936.
Island King Korndyke	...28th December, 1936.
Falconwood Sir Vale	...1st January, 1937.
Llynvenith Rocharm	...25th March, 1937.

Local Purchases.

18. During the year, the following pure bred Holstein bulls and a bull calf were purchased locally:—

Breeder.	Name of Bull.	Date of Birth.	Dam.	Sire.
Lowlands Estate ...	Caradoc ...	16th Oct., 1932 ...	Lady Margaret (Imported)	Rutgers King Sadie Vale de Kol (Imported).
Trinidad Dairies Ltd.	Sultan ...	21st March, 1934 ...	Winsome Witch of Willow Blend (Imported)	Mindona Seigis Boy (Imported).
Robert Alefounder ...	Studley Jan ...	21st Jan., 1935 ...	Jeanette ...	Parkinson.
Trinidad Dairies Ltd.	El Mena Carnation Wayne	11th Dec., 1937 ...	Peannel (Imported)	Carnation Inka Wayne Colantha (Imported).

Breeding to Pure Bred and Selected Grade Holsteins.

19. The pure bred Holstein Bull "Prince Johanna Hartog" (imported) stood for service at the Farm throughout the year. The pure bred bulls "Lowlands Chief" and "Rutgers 2" of the same breed were used in the itinerant breeding units. "Rutgers 2" was severely injured at Craignish Estate and had to be sold to a butcher, and his place in the Unit work was taken by the bull "Caradoc". The pure bred bull "Sultan" was sent to River Estate in place of the pure bred bull "Lloyd" who was transferred to the Mucurapo Service Station, where he stood for service with three other pure bred bulls and two grade bulls. The pure bred bull "Studley Jan" was sent to the Ste. Madeleine Sugar Company in exchange for the pure bred Holstein bull "Seigis Echo Rooker" (imported), who returned to the Farm for service here. The bull calf "El Mena Carnation Wayne" has grown well.

20. The selected grade (Holstein-Zebu) bulls "Baldwin" ($\frac{3}{4}$ bred Holstein) and "Champion" ($\frac{1}{2}$ bred Holstein) were again used on the Farm during the year on $\frac{3}{4}$ bred and $\frac{1}{2}$ bred cows respectively. The heifers from "Baldwin" are very good milkers, but the heifers from "Champion" in the $\frac{1}{2}$ bred breeding have not calved down as yet for comparison with other bulls used in the past in this grade breeding. Two grades bulls ($\frac{3}{4}$ bred Holstein and $\frac{15}{16}$ Holstein) stood for service at Mucurapo Station with the pure bred bulls, a $\frac{3}{4}$ bred Holstein bull was sold to Mr. Abidh for service at Chaguanas, another of the same breeding stood for service at Curepe, three of the same breeding were sold at the Annual Sale and a $\frac{7}{8}$ Holstein bull was sold to Caroni Sugar Estates.

Sussex Cattle.

21. The old pure bred Sussex Bull "Crowborough Warren Napoleon 8th" (imported) died in Tobago during the year, and a young pure bred bull was sent over at the end of the year to take his place, together with a grade ($\frac{1}{2}$ bred Sussex) Bull. The breeding of these pure bred cattle as well as the grades have been maintained separately, as in the past, and after transferring animals from the herd to Tobago, as they become available, the following was the strength of the pure bred and grade Sussex cattle on the Farm at the end of the year:—

	Bulls.	*Cows.*	*Heifers.*	*Bull Calves.*	*Heifer Calves.*
Pure Bred Sussex ...	1	4	1	2	—
Grade Sussex ...	—	4	6	3	1

It is intended to send over to the island-ward another pure bred bull and 3 grade bulls in 1938.

Zebu Cattle.

22. The Zebu cattle were divided into four lots as follows:—

(i) Full-blooded Zebus (descended from stock originally imported from India) with the Bull "Bahago" at the head of the herd.

(ii) Dairy Zebus, the cows and heifers of which are bred to the specially selected bulls "Mooraley", "Chintaman" and "Suphal".

(iii) Zebu Foundation cows, with the full-blooded Zebu Bull "Sultan" in the herd.

(iv) Zebu cows for grading with pure bred Holstein Friesian Bulls.

23. Young stock of the milking Zebu herd has responded splendidly to the form of management started in 1936—tethering them out in a coconut field where they are handled daily. The young heifers when ready to be moved into the dairy (calving boxes) are as gentle, in most cases, as European cattle. The heifers and cows of this herd, as well as all the cows and heifers in the dairy herd, have their udders massaged and are all milked before calving, the calves being removed at birth. Another young dairy Zebu bull, full brother to "Suphal", out of the best milking dairy Zebu cow—"Rookmin Jan"—is being reared as well to be used in this herd.

24. The Zebu Foundation Bull "Manbodh" was transferred to the Government Stock Farm, Tobago, during the year, and the following sales of Zebu cattle for export carried out, as there was no demand for these cattle locally :—

One pure bred Zebu Bull "Teijusingh" to Jose Estrade Palma (Cuba)	$480 00
One Zebu Foundation Bull "Boodlal" to C. Bergnes & Co. (Cuba)	300 00
Three young Zebu Foundation Bulls to Miguel Ron, Venezuela, 1 at $200 and 2 at $100	400 00
One Zebu Foundation heifer (in calf) to Miguel Ron, Venezuela...	120 00
Two young Zebu Foundation Bulls to L. Punnett, St. Vincent at $100	200 00
One young Zebu Foundation Bull to R. Delia, Venezuela	60 00
	$1,560 00

25. Very satisfactory results have been obtained, as in the past, in working all the Zebu bulls and the grade Holstein bulls : the pure bred Holstein Friesian bulls are exercised by turning them out into paddocks whenever possible.

Pasturage and Service of Privately Owned Cows.

26. Ninety-seven privately owned cows were bred to pure bred and grade bulls at the Government Stock Farm during the year (81 to pure bred Holstein Bulls, 7 to pure bred Zebu bulls and 9 to grade Holstein-Zebu bulls). Service fee $1 for pure bred bulls and 75c. for grade bulls. The revenue derived from this source was $94.75.

27. At the Department's Bull Service Station at Mucurapo, specially maintained for the dairying districts around Port-of-Spain, the services were as follows :—

To pure bred bulls	178 cows and heifers.
To grade bulls	98 do.

At River Estate, the number of cows and heifers served by the pure bred bull stationed there was 58.

28. At the Mucurapo Pasture, where a bull from the Station was turned out every night, an average of 75 head of cattle was pastured monthly during the year, made up as follows :—

Cows	38
Heifers	27
Heifer calves	10
	75

29. The number of cows and heifers admitted to River Estate for pasturage was as follows :—

Cows	13
Heifers	15

30. At the Annual Sale on 4th December, 20 grade heifers averaged $62 and 3 grade bulls $32 : there was no bid for the Zebu stock offered and they were withdrawn.

Milk Yield.

31. There was a drop in the milk yield, 33,898 gallons as compared with 40,520 gallons in 1936. The best results were again obtained from the two grade cows (half bred Holstein Friesian) "Nymph" and "Belle" who yielded 11,451 lb. in 317 days and 13,352 lb. in 361 days respectively. The revenue from the sale of milk was $16,140.22. Each cow's yield was weighed twice daily and the week's total transferred to a record book. The fat content was tested each month and the mixed milk averaged as follows :—

3.54 morning milk.

4.46 afternoon milk.

Demonstration at Health Week.

32. During the Health Week Exhibition of the City Council at the Prince's Building, Port-of-Spain, a demonstration was given twice daily (afternoon and evening) by the Stock Farm on the clean handling of milk in a dairy stall.

Health and Disease.

33. During the year 90 cows calved normally and 7 aborted : the use of the formalised abortus vaccine imported from the Institute of Animal Pathology, Cambridge, has been discontinued as it was not successful, and the preventive measures adopted were as follows :—

(i) Thorough disinfection ;

(ii) Segregating all aborting cows for two months.

(iii) Keeping all cows and heifers in the calving boxes for 21 days after calving.

34. There were no cases of Paralytic Rabies on the Farm during the year, and all the cattle were again vaccinated as a preventive measure.

35. All the cattle on the Farm were tuberculin-tested three times during the year, and there were six reactors all of which were destroyed. Tubercular lesions were also found in two other animals on post mortem examination. There were thirty-two deaths, the chief troubles being pneumonia and gastro-enteritis in calves. A special vaccine was imported through the Crown Agents as a preventive for this trouble, and since its use the incidence of pneumonia has fallen: the gastro-enteritis trouble was controlled by regular monthly dosing with copper sulphate. The causes of deaths and destruction were as follows:—

Pneumonia	12
Gastro-Enteritis	7
Debility (weak calves)	3
Parturition troubles	2
Destroyed (old age 2, injury 1)	3
Tympanitis	2
Septicaemia	2
Peritonitis	1

Horsekind.

Thoroughbred Stallion.

36. The Stallion "Young Native" had his first season, but it was most unsatisfactory, as the mares failed "to hold" and the examination of his seminal fluid showed it to be very poor. At the end of the year, after a long rest with regular exercise and special feeding, during which time he had received a course of treatment with "Enzavita" (Vitamin E), his semen was again examined and there was an abundant spermatozoa content in a good flow of fluid. He stood for service at the Farm throughout the year.

37. The movements of the three other thoroughbred stallions during the 1937 season were as follows:—

Bachelor's Tut ...	...Tobago	...	...January-December.
Nelsweep ...	...Trinidad (Farm)		...January-December.
Knight of St. Patrick (K.P.)	... do.	(Cedros)	...February-April.
Do.	do. ... do.	(Union)	...April-June.
Do.	do. ... do.	(Farm)	...January and June-December.

Bachelor's Tut did not return to Trinidad for the Livestock Show, owing to a case of Anthrax on the Tobago Stock Farm. These stallions services in Trinidad were as follows (Service fee $10 and groom's fee 60c.):—

Stallion.	*Farm Mares.*	*Other Mares.*	
Young Native	3	7	
Knight of St. Patrick (K.P.)	—	11	3 at Farm.
			4 at Cedros.
			4 at Union.
Nelsweep	4	8	

38. At the request of Mr. George de Nobriga and owners of brood mares, the thoroughbred stallion "Restigouche" (1924) by Gainsborough out of Glaciale by Polymelus, stationed at Lowlands Estate, Tobago, was transferred to the Stock Farm, Trinidad, and stood for service here from the 19th March to the 30th July. His service fee was $48 plus 60c. groom's fee, and the Farm received $10—the fee for horse breeding—for each service by this stallion. "Restigouche" was sold as a yearling for 5,800 guineas at the Newmarket December sales, and after three seasons' racing during which he won, as a three year old the St. George's Stakes, Liverpool, £2,848, he was sold to go to Belgium as a sire for 2,700 guineas. In Belgium, he sired many winners, one of which was a winner in England, and he was sold to Mr. de Nobriga in 1935. During his stay in Trinidad he served 10 mares, two of which belonged to the Farm.

Jack Donkey Stallions.

39. The Jack Donkey Stallions "Emperor 2", "Kentucky" (both imported) and "Jackie" (1934) bred on the Farm, stood for service at the Farm, and with the breeding units during the year for mule and donkey breeding. The following were the services of these Jack Donkeys on the Government Farm during the year (Service fee $4 and 60c. groom's fee to mares and $1 and 60c. groom's fee to jennies):—

	Mares.	*Jennies.*
Jack Donkey Stallion "Emperor 2"	14	8
Do. "Kentucky"	17	13
Do. "Jackie"	—	2

In the itinerant breeding units, as already mentioned, 33 mares and 41 jennies were bred to Jack Donkey Stallions. The revenue received from the service of stallions (horse and donkeys) during the year was $495.

Breeding of Mares.

40. The thoroughbred mare "Saturnia" foaled a colt foal by "Bachelor's Tut" and was bred to "Young Native". The thoroughbred mares "Barbara" and "First Offence" were not in foal and were bred to "Restigouche" and "Nellsweep" respectively, but "Frst Offence" aborted at the end of the year. The old thoroughbred mare "Miranda" died and "Eastern Flower" who was bred to "Nelsweep" was not in foal. The "Saturnia" colt by "Bachelor's Tut" was sold at the Annual Sale for $85.

41. The half-bred mares "Valerian" and "Blarney" foaled colt foals by "Bachelor's Tut" and "Nelsweep", respectively. The Valerian colt was sold at the Annual Sale for $82, and the "Blarney" colt is to be handed over to the Constabulary. "Valerian" was bred to "Nelsweep" and "Blarney" to the Jack Donkey "Emperor 2" and so were the half-bred mare "Wistaria" and the Canadian mare "Vitalia", both of whom were not in foal. The two American mares ("Moruga" and "Arcadia") and the Canadian mare "Rewa" were bred to "Nelsweep" and the old half-bred mare "Cowbell" to "Restigouche".

Donkey Breeding.

42. The donkey breeding results were not as successful as last year. The common jenny had two foals, one in January and the other in December, both of which died: the half-bred jenny had a filly foal by "Emperor 2", and was re-bred to him. The ¾ bred jenny was heavy in foal at the end of the year, and so was one of the pure bred jennies, but her foal (a filly), born this year, by "Emperor 2" died the other pure bred jenny now appears to be barren.

43. The four yearling Jack Donkeys (2 pure breds, 1—¾ bred and 1—½ bred—have all grown well, and will be available for Breeding Unit Work by the end of 1938. Throughout the year they were running in a paddock with a filly, but each received its grain separately in a stable every morning. The ⅞ filly foal out of the ¾ bred jenny has grown well, and at the end of the year was taller than her mother. She will be bred as soon as she comes into oestrum.

Pigs.

44. There were no importations this year. Two young Large Black Boars were sent to Tobago, a Berkshire Boar was loaned to the Harrisson Piggery at Santa Cruz, and two other Berkshires were used in the breeding units.

45. At the Annual Sale, 35 young pigs (24 Large Blacks and 11 Berkshires) were offered and realized $593.50, an average of about $17 per head. The highest price paid was $33 for a Large Black gilt 6 months old. Private sale of pigs during the year amounted to $146, making a total of $739.50 for all sales of pigs.

46. In addition to the Farm sows, 25 outside sows were bred to pure bred boars at the Farm—Service fee 75c. and attendant's fee 25c.—and the revenue received from this source was $18.75.

Goats.

47. During the year, the following pure bred Bucks were imported from Mrs. Arthur Abbey, of Roydon, Essex, England :—

Name.	*Breed.*	*Date of Birth.*
Didgemere Chip ...	...British Alpine	...2nd February, 1936.
Boddington Campion ...	... do.	...May, 1936.
Boddington Clown ...	... do.	...July, 1936.
Didgemere Fox... ...	... do.	... 6th March, 1937.
Didgemere Drelite ...	... do.	...29th March, 1937.
Didgemere Deemster ...	... do.	...30th April, 1937.
Baron of Coltishall ...	...Anglo-Nubian	...13th April, 1937.

The first three bucks were purchased out of our usual livestock vote, but the other four were acquired by means of a supplemental vote granted by Government, at the request of the Nutrition Committee, to encourage goat breeding more generally throughout the colony by having more dairy buck goats available for service in outlying districts. The vote for the purchase of stock is to be similarly increased next year for this purpose.

48. The pure bred British Alpine is standing up to local conditions much better than the Saanen goat, and the breeding results have been so successful that it was decided to sell all the grade does and goatlings at the Annual Sale, and to keep only the stock directly descended from the imported British Alpines. The number of these animals on our strength at the end of the year was as follows :—

12 Bucks
1 Buck kid
8 Does
6 Goatlings
2 Doe kids.

49. Twenty does were bred to British Alpine Bucks in the breeding units, 95 at the Mucurapo Service Station and 91 at the Stock Farm. Bucks of this breed were also loaned to the following districts :—Moruga, Brasso, Manzanilla and Arima. The revenue received at the Farm from this source was $68.25—Service fee 75c.

50. Three young British Alpine Bucks, one doe, and one goatling were transferred to the Stock Farm, Tobago, during the year.

51. At the City Council of Port-of-Spain Health Week Exhibition in November, a dairy goat exhibit was staged by the Department in which the handling, feeding and milking of these animals were demonstrated.

52. At the Annual Sale 11 grade British Alpine does and goatlings realized $269— the highest price paid was $38 for a ¾ bred doe 14 months old.

53. Successful results have followed the use of a Vitamin E food on a sterile Indian buck (mutton breed). Two does were heavy in kid at the end of the year for this buck, and a goatling was in kid to a young buck of the same breed as well. This young Indian buck stood for service in the Debe district, but unfortunately died from Pneumonia.

54. It is intended to breed the Anglo-Nubian bucks to this type of goat to increase their milk yield, making a dual purpose goat (milk and mutton), and in this respect it can be reported that one of the Indian does kidded two buck kids by the imported British Alpine buck " Boddington Whisk " and they will be used in outlying country districts next year.

Blackhead Persian Sheep.

55. A pure bred ram was sent over to the Tobago Farm : these sheep are doing well in the island-ward. A younger pure bred ram was sold to Mr. Albert Siegert for grading up his sheep at Monos.

56. Eight ewes (grade blackhead and common sheep) were bred to the pure bred ram at the Farm—Service fee 75c.—and the revenue from this source was $6.

Poultry.

57. The good results expected from the Black Lake Strain (Egham, Surrey) of White Leghorns have not materialised, and fewer stock were raised during the 1936-1937 season than in the past years. The Plymouth Rocks imported from Canada in 1936 have done well, the chickens feathered early and the mortality was low. The Rhode Island Reds imported from Canada at the same time as the Barred Plymouth Rocks did not do as well, laid fewer eggs, fertility was low, and the chickens delicate.

58. The hatching season (1936-1937) was started in November, 1936, and continued until May, when the pens were broken up and only infertile eggs sold. The pens were made up again in October, 1937, in time for the hatching season 1937-1938.

59. The two incubators worked satisfactorily, and the chicks were reared again on wire until they were 6 to 8 weeks old : they were then placed on the ground. Fowl pox gave a considerable amount of trouble, causing high mortality.

60. At the Annual Sale 44 lots of poultry (90 birds) and six lots of Muscovy ducks (18 birds) were sold for $298.25. The highest prices paid were $14 each for two trios of Barred Plymouth Rocks and one trio of Rhode Island Reds. The Barred Plymouth Rock trios and cockerels were good, but the White Leghorn and Rhode Island Red cockerels were much younger and not up to the usual standard.

61. The number of eggs laid during the year was 4,219, most of which were used for hatching purposes. The revenue derived from the sale of eggs was $111.19.

62. The hardy white strain of Muscovy ducks obtained by selection are easily reared and are now included in our poultry husbandry.

Pasturage and Stabling.

63. A number of cows, heifers and mares were pastured at the Farm to be bred to bulls (Zebu and Holstein-Friesians) and Jack Donkey stallions, respectively. A good many mares were also stabled here for breeding to the thoroughbred stallions owing to "Young Native's" first season and "Restigouche" standing at the Farm. The Goat stabling accommodation was fully used up, but only a few sows and sheep were stabled. The revenue for pasturage and stabling was $1,374.83.

Sale of Stock.

64. The Annual Sale was held on the 4th December, and there was a very good attendance.

65. The Sale as in the past years, was conducted by the Officers of the Farm, and the amount realised was about the same as last year $3,159.75. Details of the various classes of stock sold at the Sale are given below :—

	Number.	*Value.*
		$ c.
Cattle	25	1,832 00
Horses	2	167 00
Goats	11	269 00
Pigs	35	593 50
Poultry	90	282 75
Ducks	18	15 50
		$3,159 75

66. Private sale of stock amounted to $2,225.52 making a total of $5,385.27 for 1937.

Rainfall, Pasturage and Fodder Crops.

67. The rainfall for the year was low, 55.72 inches as compared with 71.08 inches in 1936, but it was more evenly distributed than the dry year of 1934 (47.02 inches). The lowest rainfall was in May (0.19 inches) and the highest in November (11.44 inches), but during the dry season there were heavy showers in January and April.

68. With this equal distribution of rainfall, the pastures were green most of the year, and there was no necessity to cut more than five acres of Uba cane for the stock this year. The Constabulary were again supplied with grass throughout the year, and the Farm also supplied all the fodder (60,000 lb.) for the Livestock Show.

69. The pen manure was removed daily into the grass fields, when not required for cane cultivation and spread out. Para grass from ravines was again scattered over the manure to get it more established in the fields, and six acres were specially treated in that way, the first cuttings from which were supplied to the Livestock Exhibition in October. The revenue received from the sale of grass, chiefly from the Constabulary, amounted to $2,142.58.

Uba Canes.

70. With the heavy rains in November (11.44 inches), there was no necessity to cut Uba cane up to the end of the year for fodder, but with the very dry spell in May this emergency bulky food had to be used from 25th May to 16th July. Only five acres were cut for the year, the fodder being only fed for 12 days in January and February, and this allowed two fields of ratoons to become well established again.

Sugar Cane.

71. Crop was started on 8th March and ended on the 4th May. The canes were supplied to Orange Grove Estate, the tonnage delivered was 1,008 tons, 15 cwt., 2 qrs. The revenue from the sale of cane, was $2,784.18, as compared with $1,926.30 in 1936 when 684 tons were sold. The canes were sold at $2.76 per ton, the Farm receiving a bonus of 12c. per ton. During the year 10 acres were planted in B.H. 10(12), and they were so well advanced that they will be cut as plants next year together with 1½ acres of "stand overs" of the same variety. The estimate of our crop for 1938 is again 1,000 tons.

Coconuts.

72. Owing to better prices, the demand for "select" nuts for shipment abroad and to avoid having a large percentage of germinating nuts, the trees were picked twice during the year. The culls as well as the selects were sold through the Co-operative Coconut Growers' Association and the revenue from these sales was $680.83.

Water Supply.

73. Early in the year the Farm's supply was connected up with the main distribution of the new Central Water Supply, and additional pipes were laid down to meet requirements. The subsidiary supply obtained from the Blake's Ram in the St. Joseph River and the Water Tower was again quite good throughout the year.

74. The St. Joseph River frequently overflowed the concrete apron across it on the road to the St. Augustine Nurseries and Experimental Station, and the Public Works Department has decided to extend the apron on each side of the banks of the river next year.

Improvements and Repairs.

75. The Public Works Department carried out the following work at the Farm :—

Officer-in-Charge's quarters ...	...Repaired and painted.
Dairy Foreman's quarters ...	...Two new rooms added, repaired and painted.
Lodge at Eastern Boundary	...Out-offices (Kitchen and W.C. erected).

The new quarters for the Assistant Officer-in-Charge was completed early in the year and occupied.

76. A new goat run was erected by the Farm, the fencing and iron posts being specially imported from Canada.

Educational Work, Visitors, &c.

77. The Agricultural Society held one of its monthly meetings (August) at the Farm, and a lecture was given by the Officer-in-Charge on the Breeding and Management of Dairy Cattle. The members of the Sangre Grande District Agricultural Society also visited the Farm. The Staff and post-graduate students of the Imperial College of Tropical Agriculture had one of their field outings (1st January) at the Farm, and the Diploma students attended at the Farm for some of their practical classes. The Principal and students of the Caribbean Training College spent an afternoon at the Farm and educational visits were also paid by the following schools :—

North Trace Government School.
Woodbrook Intermediate R.C. School.
Rosary R.C. School.
Piccadilly E.C. School.
Princes Town C.M. School.
Matura Government School.
Tacarigua E.C. School.
Gasparillo R.C. School.
Pointe-a-Pierre R.C. School.

78. The following were among the visitors during the year :—

The Colonial Secretary.
The Colonial Treasurer.
Sir Arthur Pugh, Mr. G. A. Jones and Mr. T. Fitzgerald (Members of the Unrest Commission).
The Secretary for Labour.
The Director of Medical Services (Acting).
The Principal, Tranquillity Intermediate School for Girls.
Mr. Truskey (West Africa).
The Trade Commissioner, General Netherlands Dairy Union.
The Government Veterinary Officer (Antigua).
Dr. Samuel Katz (Boston).
Miss Enid H. Jenkin (England).
Mr. A. Woodhouse (Columbia).
Mr. H. L. Denison (Honolulu, U.S.A.)
Mr. T. N. Hoblyn (England).
Mr. B. H. Archibald.
Capt. the Hon. A. A. Cipriani.
The Hon. E. V. Wharton.
Mr. C. W. Fleming.
Mr. George de Nobriga.
Mr. John Stanhope Lovell.
Mr. M. Lloyd.

Revenue and Expenditure.

Revenue.	$	c.	Expenditure.	$	c.
Sale of Stock	5,385	27	Personal Emoluments	4,248	00
Sale of canes	2,784	18	Maintenance	13,112	10
Sale of milk and eggs	16,251	41	Gatekeeper, Trinidad Government Railway	120	00
Stud Fees	977	20	Travelling	70	59
Pasturage and Stabling	1,374	83	Motor Lorry Expenses	1,146	87
Miscellaneous	3,261	41	Expenses of Annual Sale	116	48
			Grass Land Experiments	143	70
			Materials	1,829	69
			Stock—Purchase	2,898	89
			do. —Feed, purchase of	8,175	14
			do. —Expenses of Stallions ...	719	54
	$30,034	30		$32,581	00

H. V. M. METIVIER,
Officer-in-Charge, Government Farm.

REPORT OF THE VETERINARY DIVISION, 1937.

General.

Mr. M. D. Lumsden, B.V.Sc. (Ontario), Veterinary Officer, Trinidad, proceeded on leave to the United Kingdom on the 25th July, and was still away on leave at the end of the year. Departmental arrangements were made to carry out his duties during his leave.

2. At the request of the Government of the Windward Islands, I sailed to St. Lucia on the 9th November on official duty to inspect livestock improvement work which is being carried out by the Agricultural Department of that dependency, and returned to Trinidad on the 17th November.

3. On my way to and from St. Lucia, it was possible to spend three days in Barbados, where, with the assistance of the Government Veterinary Officer, an opportunity was afforded me to see the livestock work being carried out in that island. Visits were paid to the quarantine station, the abattoir, the market, the dairy and the piggery at the Mental Hospital, the cattle at the Dodd's Reformatory, the Constabulary horses at headquarters and at out-stations and the British Alpine Bucks. At the request of the Commissioner of Agriculture for the Leeward and Windward Islands, I examined the bay thoroughbred horse "Facetious" in Barbados, and recommended him as a suitable stallion for the island of Barbuda.

4. Mr. L. C. Hutson, B.V.Sc. (Ontario), Government Veterinary Officer, Antigua—Leeward Islands, arrived in this colony on duty leave in October for a fortnight to attend the Livestock Exhibition, and to inspect the work that is being carried out at the Government Stock Farm.

5. During his visit, Mr. Hutson purchased out of money allocated by the Colonial Development Fund, five grade dairy bulls (Holstein Friesian-Zebu crosses), four grade British Alpine Bucks and three grade Blackhead Persian Ram Sheep for the Antigua Government.

6. The Veterinary Officer, Tobago (Mr. T. A. des Iles, B.V.Sc., (Ontario) was granted duty leave to attend the Livestock Exhibition in Trinidad, and during September I visited the island-ward and inspected the stock at the Farm.

7. The Animal Husbandry Committee of the Agricultural Society of which the Senior Veterinary Officer and the Government Veterinary Officer (attached to the Government Stock Farm) are members, submitted a report to Government early in the year with a view to encouraging the peasantry in the rearing of livestock. One of the chief recommendations was the appointment of a Livestock Officer. This recommendation was accepted by Government, and provision has been made in the estimates for 1938 to readjust veterinary duties in Trinidad so as to allow the Assistant Officer-in-Charge of the Stock Farm, Trinidad, to be appointed to the post.

8. I served as a member of the Nutrition Committee during the year and attended all its meetings. This Committee recommended to Government that money should be provided in 1937 to purchase four young pure bred Holstein Friesian Bulls from Canada and four young pure bred British Alpine Bucks from England in order to increase the itinerant breeding units of the Department from two to four in 1938; further, that provision should be made in the 1938 Estimates for six additional bulls and six additional buck goats of the same breed to be purchased in order to replace scrub bulls in out-lying districts and that similar provision should be made for two or three more years. These recommendations were accepted by Government.

9. The Committee further recommended that steps should be taken to make compulsory the registration of all sires (especially bulls, buck goats and boars) as soon as sufficient sires for replacing scrub stud animals are available.

10. The second Livestock Exhibition was held during the year, Government assisting by voting $1,000 toward the cost of the Show plus $300 for purchasing equipment. With Government's assistance, it is hoped that the Exhibition will become an annual event, and that in the future with further aid, the district Agricultural Societies will hold Livestock Shows in country districts especially in the island-ward.

11. The Exhibition was an improvement on the 1936 show, with the exception of the poultry exhibits, due to late moulting. The dairy cattle and horsekind exhibits were of a high standard, especially the heifers and the yearlings (horses) in the thoroughbred and half bred classes; many of the winners in these classes were from Tobago. Both the Senior Veterinary Officer and the Government Veterinary Officer, Government Stock Farm, Trinidad, served as members of the Exhibition Committee and attended all the meetings.

12. Paralytic Rabies (bat-transmitted) was again responsible for a number of deaths in livestock in Trinidad, but there were only 57 cases as compared with 217 in 1936 and 331 in 1935. The incidence of the disease was again highest in the North-Eastern area in the Sangre Grande district.

13. A "Rabies" Inspector of the Medical Department was again attached to the Veterinary Division during the year to assist the Veterinary Officers in the field work with this disease.

14. The Government Bacteriologist (Medical Department) carried out the research work of this disease as in previous years, as the condition is one that affects man as well as domesticated animals.

15. The Senior Veterinary Officer attended all the meetings of the Board of Agriculture, and presented reports on paralytic rabies which were published in the daily papers.

16. With the approval of the Secretary of State for the Colonies the Regulations dealing with the Diseases of Animals Ordinance were amended by the Governor in Executive Council with regard to the fees payable for inoculations, vaccinations, tuberculin testing, &c. Under the new regulations all such dues are to be paid into the Treasury and the Senior Veterinary Officer is to receive as from the 1st January, 1938, a duty allowance of $480 per annum instead.

A.—DISEASE CONTROL.

(1) Field Operations.

Proclaimed Diseases.

17. *Anthrax.*—Three cases occurred in September on the Tobago Stock Farm in small stock (1 pig and 2 goats). The necessary preventive measures were enforced after proclaiming the area and all stock on the Farm, 278 head, were vaccinated (simple spore vaccine) against the disease. The restrictions on the Farm were removed on the 23rd October. Five hundred and forty-three head of Venezuelan and British Guiana cattle removed from the Quarantine Station to out-districts were vaccinated against the disease before leaving the station.

18. *Glanders and Epizootic Lymphangitis.*— No cases reported. As in past years a few cases of Ulcerative Lymphangitis have been confused with "Farcy" and Epizootic Lymphangitis.

19. *Swine Fever.*—Veterinary certificates signed by a Government Official and countersigned by the British Consular Body accompanied all chilled pork, hams, &c., imported from the Argentine and Brazil during the year. This procedure has been adopted since 1931 when an outbreak of Swine Fever (controlled by "slaughter" policy) was traced to feeding "Swill" from imported chilled meat.

20. *Foot and Mouth Disease.*—Sanction was given to import seven buck goats (six British Alpines and one Anglo-Nubian) from England during the year for the Stock Farm. Some difficulty was experienced in getting the animals into the Quarantine Station at the Port of London, and they were allowed to be imported subject to Certificates of Health from the Ministry of Agriculture and Fisheries accompanying them on arrival. Twenty Murrah Water Buffaloes were landed in the colony in January from Calcutta and they were quarantined on arrival from the 22nd January to the 18th March.

21. *Tuberculosis.*—Five cases were discovered in Abattoirs and the incontacts, chiefly from estates, were tested by the private veterinary practitioners concerned and nine reactors were found. In the rural districts around Port-of-Spain 973 dairy cows and heifers were tested in 377 cowsheds and three reactors discovered: these animals were slaughtered and their owners compensated. In Tobago four reactors were found and destroyed, compensation being paid to the owners. Seventeen head of cattle were tested at the Quarantine Station, Port-of-Spain, with negative results during the year.

22. *Rabies.*—Fifty-four dogs were quarantined against Rabies on arrival in the colony, including 23 in transit. Three domestic cats and one tiger cat—all in transit— were detained during their stay in the colony. No cases of Rabies occurred at the Detention Station, but one of the dogs died from other causes.

23. *Paralytic Rabies in Livestock* (*Bat-transmitted*).—The incidence of this disease fell considerably during the year, and of the 57 cases recorded, their distribution can be summarised as follows:—

A. Northern Area (37 in Sangre Grande district)	39
B. Central Area (Tamana 8)	11
C. Southern Area (Moruga 5)	7
	57

The disease, which does not occur in Tobago, was controlled by (*a*) vaccination of livestock (*b*) destruction of bats by shooting, trapping, poisoning, &c. A carbolised brain (30 per cent.) emulsion vaccine prepared by the Connaught Laboratories, Canada, was again used with satisfactory results. The Veterinary Division vaccinated 3,058 animals during the year and issued 1,056 doses of vaccine to private veterinary surgeons. The work was again done free of any cost to the small livestock owner. No cases of the disease occurred in protected animals. The destruction of bats was carried out by the Medical Department and a large number was caught and destroyed, of which 3,377 (including 2,247 *Desmodus* species) were examined by the Government Bacteriologist. Negri bodies were found in 143 Desmodus bats and their distribution was widespread over the island of Trinidad.

Non-Proclaimed Diseases.

24. *Haemmhoragic Septicaemia.*— Three pigs died from this disease on the Government Stock Farm, Tobago, and the condition was controlled satisfactorily by the use of Serum and Bacterin—double inoculation treatment. Forty-three incontact pigs were treated and no further cases occurred.

25. *Strangles and Influenza.*—Few cases were reported during the year, the vaccination of imported American mules against these diseases before shipment is responsible for the low incidence of the condition on the sugar estates.

26. *Tetanus.*—With the early treatment of all wounds and the use of anti-tetanic serum on wound about the feet and especially in areas where cases usually occurred (sugar estates in certain districts) fewer cases have been reported.

27. *Parasitic Gastritis in calves.*—With the lower rainfall during the year, and the better feeding of calves both on estates and in the large dairies, no serious outbreaks occurred. The regular monthly dosing with Copper Sulphate has been quite successful on the Stock Farms.

28. *Bovine Piroplasmosis.*—Six pure bred bulls (five from Canada and one from the United States of America) were imported during the year—the oldest being 1 year old; they all became naturally immunized to "Red Water" fever without showing marked clinical symptoms: as on previous occasions no anaplasmosis reaction was observed on the imported young bulls.

29. *Pneumonia in Calves.*—Several cases occurred in the calves on the Government Stock Farm and a preventive vaccine was imported at the end of the year to control the condition.

30. *Ulcerative Lymphangitis in Horsekind.*—This disease which was most prevalent in wet muddy districts such as Caroni and La Fortune Estates, is not so frequently seen. Wounds about the limbs predispose to the condition and with early and regular treatment of all abrasions, cuts, &c., the incidence of the condition has been considerably reduced.

31. *Contagious Abortion in Cattle.*— This disease is of low incidence and is rarely seen in the large herds on Sugar Estates. It is more prevalent in dairy cattle due to introduction from abroad, but with importers insisting on Agglutination certificates when importing stock and with quarantine restrictions carried out in dairying herds where the disease occurs, fewer cases result. The recommendations of this Division in dealing with this disease are as follows:

(1) Stabling of all cows in calf in a "Maternity" pen wherever possible.

(2) All calving cows to be segregated in this pen for twenty-one days after calving, before returning to the herd.

(3) All aborting cows to be isolated for two months before they are put back in the herd.

32. *Ophthalmia in Calves.*—It is pleasing to record that, with the use of more sanitary methods in the pens of young calves, fewer cases occurred in dairy stock in the colony.

Inspection of Animals.

33. The following animals were imported into the colony during the year and inspected :—

Horses—including 2 thoroughbred colts and 4 thoroughbred fillies from the United Kingdom, 12 riding horses for the Constabulary from Canada, 2 Percheron mares in foal and 1 American saddlehorse from the U. S. A., 30 working ponies from the Venezuelan Mainland, 18 ponies from the island of St. Martin (French Section), 30 heavy draught mares and 2 Percheron stallions from the Argentine Republic in transit for Venezuela	210
Mules—including 115 large American mules (Kentucky) 125 small Venezuelan mules and 160 medium sized mules from the island of St. Martin (French Section) ...	445
Donkeys—chiefly from the Windward and Leeward islands	202
Dogs—including 22 from Great Britain and 21 from U.S.A. (hounds)	71
Cats—one domestic cat and 1 Tiger cat	2
Cattle—including 3 Holstein Friesian Heifers from England, 1 Holstein Friesian Bull from the Carnation Farms, Ltd., U.S.A., 5 Holstein Friesian bull calves from Canada, 45 head of dairy cows and heifers from Barbados, 887 head from British Guiana for slaughtering purposes and over 8,000 head from Venezuela (beef cattle)	9,489
Murrah Water Buffaloes—8 bulls, 7 cows and 5 bull calves from India	20
Pigs—over 4,000 from the Windward Islands and 800 from British Guiana for butchering purposes	5,298
Sheep—chiefly from Grenada and St. Vincent for slaughtering purposes	1,970
Goats—including 1 Anglo-Nubian and 6 British Alpine Bucks from England, 37 dairy goats from Barbados and over 5,000 from the Windward Islands for slaughtering purposes	5,271
Circus animals—Circus animals belonging to a visiting Company were segregated on the circus grounds after inspection. The animals included horses, lions, elephants and tigers.	

Quarantine Station.

34. The following animals were admitted to the Quarantine Station :—

Horses	56
Mules	46
Donkeys	46
Cattle	9,306
Water Buffaloes	20
Pigs	999
Sheep	178
Goats	394

During the year attention was drawn to the unsatisfactory conditions, at times causing injury and suffering, under which slaughter cattle were landed. Arrangements were made for such cattle to be landed at the St. Vincent jetty and transported in railway trucks to the Quarantine Station instead of being landed in punts at the detention station jetty. Five hundred and forty-three cattle were vaccinated against Anthrax before they were removed from the Quarantine Station and 17 head of cattle tuberculin-tested —all negative. The fees for the duties by this Division were as follows :—

Fees for examination of animals	$7,686 48
Contribution from City Council for supervision of Quarantine Station ...	480 00
Animal inoculations, &c.	670 00
Sale of Rabies vaccine	110 78
	$8,947 70

(2) RESEARCH OPERATIONS.

35. Research work was only carried out in one disease—Paralytic Rabies (bat-transmitted)—and this was done by the Government Bacteriologist (Medical Department). The section of the work of most interest to this Division was that on Rabies in the Desmodus Bat, the results of which were published early in the year, and can be summarised as follows :—

1. Desmodus bats are susceptible to artificial inoculation with the virus of rabies.
2. The disease thus produced may be of the furious or the paralytic type, or there may be no clinical symptoms.
3. Desmodus bats caught in natural conditions may be found to be unduly excited and " furious " or may appear healthy without evidence of disease. They may, however, in both cases be infected with rabies.
4. Desmodus bats with symptoms of furious rabies, or without any evidence of disease, following natural or artificial infection are capable of transmitting rabies to animals by their bites.
5. Desmodus bats may become carriers of rabies after " recovery " from the furious form of the disease. In this state, they may remain capable of spreading infection by their bites for prolonged periods.

B.—ANIMAL HUSBANDRY.

(1) FIELD OPERATIONS.

36. In my report on the Government Stock Farm detailed information is given that makes clear the activities of the Farm on behalf of the livestock industry of the colony. In the past, animal husbandry has received much attention at the Farm and efforts to encourage a greater interest in livestock in the island has been based on the work of the Farm.

37. Stud animals for the improvement of livestock in the colony stood for service at the Government Stock Farms in Trinidad and Tobago, as well as at the Mucurapo Service Station and River Estate. Animals available for these services are as follows :—

Thoroughbred Stallions.
Jack Donkeys for mule and donkey breeding.
Zebu Bulls (Work and Milk).
Holstein Friesian Bulls (grade and pure bred.)
Sussex Bulls (Beef).
Murrah Water Buffalo Bulls.
British Alpine Buck Goats (Milk).
Anglo-Nubian Buck Goat (Milk).
Indian Buck Goat (Mutton.)
Blackhead Persian Ram Sheep.
Large Black Boars.
Berkshire Boars.

Eggs from the following breeds of pure bred poultry were sold, as well as chicks during the hatching season at the Stock Farms in Trinidad and Tobago :—

White Leghorns.
Barred Plymouth Rocks.
Rhode Island Reds.

An annual Sale of surplus stock at the Government Stock Farm, Trinidad was held during December.

38. In order to stimulate the interest in livestock rearing among the peasantry, two itinerant breeding units, each consisting of a pure bred Holstein Friesian Bull, a Jack Donkey Stallion for mule and donkey breeding, a British Alpine Buck and a Boar pig visited 8 districts of the colony and stood for service for two months in each place in Trinidad. Bulls were sent to eight out districts and boars to three centres in Tobago. Further particulars of this work will be found in the report of the Government Stock Farm, Trinidad.

39. In Tobago, monthly visits were paid by the Veterinary Officer to the following out-districts for holding clinics and giving advice to the peasants :—

Charlotteville.	Plymouth.
Moriah.	Les Coteaux.
Castara.	Speyside.
Parlatuvier.	Roxborough.

40. In Trinidad, lectures in animal husbandry were given by the Veterinary Officers at the following places :—

Government Farm (St. Joseph).
San Juan (District Agricultural Society).
Tacarigua do. do. do.
Sangre Grande do. do. do.
Chaguanas do. do. do.
Naparima. do. do. do.

41. The Government Stock Farms have also been used for demonstration purposes during the year to school teachers and children, colleges and agricultural societies.

(2) RESEARCH OPERATIONS.

42. *Dairy Cattle.*—At the Government Farm, Trinidad, research work in the breeding of suitable dairy cattle for the tropics has been carried out :—

1. By crossing the Holstein Friesian (production) with the Zebu cattle (constitution) to determine the percentage of tropical blood that is essential for necessary hardiness.
2. Selection among Zebu cattle (indigenous tropical cattle).
   Zebu calves are removed from their mothers (specially selected) at birth, reared on the pail and handled regularly until they calve when they are treated like ordinary dairy cattle. Special selected Zebu Bulls are reserved for this breeding work.

43. *Beef Cattle.*—Work in crossing Sussex cattle (imported temperate climate beef cattle) on Zebu Foundation stock has been continued both in Trinidad and Tobago. All available bulls of this cross as well as pure bred Sussex bulls are sent over to Tobago as they become available in Trinidad, where breeding of bulls for this work is being carried out.

44. *Goat and Sheep Breeding.*—The work of crossing British Alpine Buck goats with ordinary common and grade goats for milk production has been so successful that work is now concentrated on breeding and selecting buck goats of this breed only for out-districts.

45. Anglo-Nubian goats have also been imported and will be crossed with Indian Lop-eared goats in order to obtain a dual purpose goat (milk and mutton) : this work will be started in 1938.

46. At the Government Farm Tobago, and at Lowlands Estate in the same island, experiments are being carried out by crossing Blackhead Persian Sheep with African Woolless sheep, both tropical breeds; the latter is hardier but has a poorer quality mutton, and it is hoped to determine the percentage of blood of the African Woolless type for the most suitable cross.

C.—IMPROVEMENT OF MARKETING OF ANIMALS AND ANIMAL PRODUCTS.

(1) Animals.

47. With regard to Trinidad the marketing of animals is unimportant, as most of the meat consumed is imported either as live animals, imported chilled meat or salted meat. In the case of Tobago, where animals are shipped to the Trinidad market, an attempt has been made by this department to assist producers and the "middleman" from selling their animals on the pier alongside the boats that convey the stock to Trinidad by obtaining permission from the City Council to use the pens at the Port-of-Spain Abattoir for marketing these animals. This has not been successful owing to financial difficulties, as in the majority of cases freight for conveying the stock, including poultry, is only paid afer the sale of the animals on the pier, so their removal to another place is held up and they are still at the mercy of the butchers. It has also been suggested that the stock should be shipped to Trinidad through some agency—Tobago Producers' Association—and on their arrival arrangements should be made for an auction sale. Extensions have been made to the market accommodation for the sale of meat, &c., in Port-of-Spain, and a new market erected at S n Fernando. The Health Department are to take steps gradually to build central abattoirs and markets in rural districts to replace private slaughter houses and scattered meat tables under sheds and provision shops.

(2) Milk.

48. A considerable amount of condensed milk is imported, but the production of fresh milk has increased considerably through the efforts of the Department. The bulk of the fresh milk is still produced and distributed by East Indians in rather a primitive way, but about 800 gallons daily are now supplied from modern dairies where cows are well-housed and milk distributed in proper bottles. Four of the largest of the dairies are equipped with sterilizing, pasteurizing and cooling appliances: two of these pasteurizing plants were erected during the year. The consumption of fresh milk has increased due to the establishment of milk bars, especially in Port-of-Spain. Provision has been made in the 1938 estimates to supply 500 children with ½ pint of fresh pasteurised milk daily.

(3) Animal Products.

49. A new method of treating hides has been started, in which the dry salted hides are prepared by drying them in a stove and they are folded up for shipment in the ordinary way. Very few wet salted hides are now exported, as a considerable number is used in the local tanneries: all this work is concentrated around the Port-of-Spain Abattoir.

D.—VETERINARY EDUCATION.

50. Elementary lectures on veterinary science were given to the second year diploma students of the Imperial College of Tropical Agriculture. The post graduate students were also given lectures on important tropical veterinary diseases more especially with regard to methods of control.

E.—STATISTICS.

Importation of Livestock, 1937.

		Number.	*Value.*
Cattle	...British Guiana	899	$19,102
	British West Indies	31	908
	Dutch Guiana	8	120
	Venezuela	8,353	212,659
Goats	...British West Indies	4,987	10,184
	Venezuela	4	10
Sheep	...British West Indies	1,894	4,750
Swine	...British Guiana	1,067	8,721
	British West Indies	4,645	32,811
	Venezuela	123	940
Poultry	...British Guiana	575	239
	British West Indies	47,447	16,840
	Total		$307,284

Importation of Meat, 1937.

	Weight. (*cwt.*)	*Value.* $
Fresh (chilled, &c.)		
Beef and Veal	6,671	68,297
Mutton	2,029	22,976
Pork	679	11,224
Other sorts	139	3,219
Poultry (dead)	702	16,718
Game (dead)	12	338
	10,232	$122,772
Pickled or Salted.		
Beef and Veal	11,915	95,580
Pork	14,103	139,133
Other sorts	120	1,349
	26,138	$236,062
Smoked or Cured.		
Beef and Veal	6,439	48,048
Bacon and Ham	7,693	142,739
Other sorts	1,100	23 999
	15,232	$214,786
Canned, tinned, &c.		
Pastes	297	4,920
Other sorts	4,929	87,692
	5,226	$92,612

Importation of Livestock from Tobago, 1937.

Animals.	*Number.*	*Value.*
Horses	27	$1,350 00
Mules	23	1,380 00
Donkeys	42	1,008 00
Sheep	511	1,839 00
Goats	1,710	5,130 00
Pigs	2,849	22,792 00
Cattle	688	20,640 00
Dogs	35	140 00
Fowls (doz.)	2,202	12,683 52
Eggs (doz.)	983	294 90
Turkeys (doz.)	6½	87 20
Total	...	$67,344 62

H. V. M. METIVIER,
Senior Veterinary Officer.

REPORT OF PLANT PATHOLOGIST, 1937.

General.

In relation to diseases of crops, the year under review may be said to be an average one. The month of January was abnormally wet, resulting in excessive damage to cacao from Black Pod (*Phytophthora Sp.*). Further, a long dry spell in the second half of the year was responsible for destroying large numbers of chirellos and young pods of cacao. These factors of fluctuating weather conditions are very upsetting in the growing of tropical crops. Though Trinidad and Tobago have somewhat normal periods of wet and dry seasons, still in most years, at one period or another, abnormal conditions prevail and what promised to be a good crop of cacao, citrus, coffee, &c. can be appreciably reduced.

2. Such being the facts, it is very difficult for planters and members of agricultural institutions to make adjustments in agricultural practices to meet the requirements of crops; an adjustment may be admirable for one year and a mistake the next year. Thus traditions and long established methods have a good deal of soundness in them and changes require to be carefully introduced and always set up on an experimental basis.

Cacao.

3. In recent years, appreciable reduction of this crop is shown by export figures. There are several causes for this such as (*a*) some properties abandoned as a result of economic slump; (*b*) many properties semi-abandoned for the same reason; (*c*) some substitution of sugar cane for cacao; (*d*) increasing losses from diseases and pests (Witchbroom, Black Pod, Thrips, Vermin, &c.).

4. But when one studies cacao properties which have been consistently well maintained, the results are much more satisfactory and reassuring. In such instances, one finds that the practices of annual pruning, which includes witchbroom control, and general sanitation and routine attention to drains, &c., that these properties crop at double the average for the Colony.

Witchbroom Disease (*Marasmius perniciosus*).

5. This fungus disease is very severe in its incidence in some districts, especially in low-lying flat lands. It would appear that in these places the only satisfactory procedure would be to grow alternative crops. This has been advocated long ago by the writer, but the chief difficulty is the financing of such changes and the problem of finding a satisfactory alternative crop.

6. In other districts, the incidence and damage is of a medium kind and if good prices were operating for the crop, it seems tolerably certain that the disease could be controlled. Again, taking the Northern Range, which is probably the largest unit in cacao in the Island, one finds the disease is absent or only little in evidence after it has been in Trinidad for a period of ten years. Unfortunately, large sections of cacao in this area are old and relatively poor cropping; and there are many signs of neglect.

7. It may not be generally known what the complex of the pathogen in relation to the host really represents. One has to visualize: (1) that some *active* vegetative and flower cacao buds occur throughout the year; (2) that some sporophores (mushrooms) occur throughout the year; (3) that *active* buds are much more numerous at certain periods of the year; (4) that sporophores are much more numerous at certain periods of the year; (5) that in the period of a year there is mass production of (*a*) active buds and (*b*) sporophores; (6) that the buds are entirely out numbered by the spores; (7) that vegetative growth of cacao tissues is typically associated with the dry seasons of the year; (8) that sporophores production is typically associated with the wet seasons of the year; (9) that Witchbroom disease is cumulatve, *i.e.*, it is not a question now of incidence in any one year because we know that in badly infected zones, and for that matter, in moderately infected areas, there is always a residue, and an increasing residue, of the fungus parasite present even in the best controlled properties. And, moreover, this fungus is saprophytic in the mushroom bearing stage and can produce fructifications *in situ* or on the ground for a period of 18 months or until the food reserves are exhausted. Great importance must be attached to the numerical aspect of the problem, *i.e.*, the competition between the marasmius spores and the cacao tissues. It is probably correct to state that one sporophore of *Marasmius perniciosus* produces at least 20 million spores.

8. From the above, it can be claimed that the most effective control measures for the disease on the existing susceptible trees will be those designed to reduce sporophore production to a minimum, and this has always been the policy advocated. In the last analysis, the economic status of the industry will determine eventualities.

Witchbroom Disease and Crop Loss.

9. For the crop year 1936-1937 it was decided to select ten (10) acre blocks of cacao on each of a number of properties in witchbroom infected districts with the object of determining the percentage loss of mature pods. In this connection it should be noted that big losses of immature pods result from this disease but it is impracticable to make counts of them. Records are now available on eleven properties, and, in addition, large numbers of records of a similar nature on small experimental plots from practically all parts of the Island are on file.

10. Below are set out the records in the above-mentioned eleven estates.

Estate.	Number of Pickings 1936-1937.	Percentage of Witchbroom Pods.
A	6	14
B	4	42
C	4	39
D	4	36
E	4	25
F	3	20
G	4	39
H	4	66
I	5	36
J	5	37
K	2	58

11. From the above it will be seen that the average loss on the above properties was 37.5 per cent. If estate A is excluded, which, before and since witchbroom, has been a well maintained property, then the average loss of pods on the remaining estates equal 40 per cent.

12. Seven of these estates are located in Guaico-Tamana and give an average loss of approximately 38 per cent.; two properties are situated in El Branche, Manzanilla, where the average loss is 22.5 and the remaining two estates are in a localized area in Charuma in the Biche district where the average loss is 51 per cent. For comparison with the above, it may be mentioned that at Marper (Government) Estate, Manzanilla, which is situated in a heavily infected witchbroom area, the loss of pods during the same crop year was 7.5 per cent. At present the practice at Marper is to make a complete " round " of collecting and destroying witchbroom tissues (pods and brooms) every three months, *i.e.*, four times a year.

Witchbroom Observation Plot for Mushrooms.

13. Data is now available for one complete year on the production of sporophores (mushrooms) on 100 cacao trees in a heavily infected area in Manzanilla. It has been the practice during this period to make daily collections and counts of the " mushrooms ". The total for the year is 55,471 mushrooms which is equivalent to 150,000 per acre of cacao, or 500 mushrooms per tree per year. The outstanding month for incidence was October, 1936, with a figure of 19,395 : the following month had 6,378, and the December figure was 9,084. There can be no doubt whatever that cacao properties with such high mushroom incidence are losing at least half the crop from this disease.

Witchbroom resistant trees.

14. *A.—Past, B—Present, C—Future.*

A—Past.

1. 1934 *Series in Trinidad.*—In this year some 150,000 cacao trees were searched in severely infected areas in an attempt to discover resistant or immune types. This work has been continued to date and by a process of elimination 12 trees remain which show resistance. Pods and budwood have been, and are being collected from these trees. Every care and attention is being given to promote cropping and flushing of the selected trees.
2. 1936 *Series in Trinidad.*—An additional 60,000 trees were searched during 1936, the method being to eliminate all trees with five or more witchbroom tissues. As a result, 17 trees remain on this list with indications of high resistance. It is proposed that field observations, *i.e.*, monthly inspection and checking will be continued to about April, 1938, before pods and budwood will be used for propagation.
3. *Marper (Government) Series.*—Seven trees on this estate come into consideration and require to be handled in the same way as the 1934 series.
4. *Introductions from Surinam, Ecuador, &c.*—These were sent to the Quarantine Station St. Augustine, and if found satisfactory will be planted in witchbroom infected areas and carefully watched.

B.—Present.

15. Nurseries are established at Plum Road, Manzanilla. There are two of these nurseries; (1) On St. Isabella Estate (2) On El Receurdo Estate. The former nursery contains 529 healthy plants comprised of 414 seedlings and 115 budded out of a total of 885 plants; and the latter nursery contains 15 budded plants from the Imperial College of Tropical Agriculture, St. Augustine, out of which six have been attacked by witchbroom, and in addition 61 healthy budded plants from other sources. It is proposed to plant out in permanent sites, the most promising of the above at Marper Estate.

C.—Future.

16. Marper (Government) Estate purchased in 1929 has taught certain definite lessons in relation to witchbroom disease.

17. Examples of this are: (*a*) Cropping data in a heavily infected area. It is significant that this estate comprising 92 acres of cacao, maintains an average yield of 2½ bags (165 lb.) per acre per year from the time of purchase. In the writer's view, the whole of the cacao district in which Marper Estate is located, an area comprising several thousand acres, was cropping at about 2 bags per acre prior to 1928, the first year of witchbroom in Trinidad; (*b*) incidence of witchbroom is on the increase in spite of systematic efforts at control. During the early years of witchbroom at Marper, pod loss was about 2 per cent. Then it increased to 3 or 4 per cent.; and last year the figure was 7.5 per cent. Indications are that there will be a slight increase next crop; (*c*) cost of control is known. At present this figure is about $4 per acre per year. And it is probable that a commercially managed estate could do this work at between $3 and $3.50 per acre per year. Thus to succeed, one requires good crops and good prices; and unfortunately the former is largely lacking in many parts of the Island, and the latter definitely lacking at the time of this report (January 1938).

18. Now that Marper Estate has supplied the planting community with the above important data it should be possible for this estate to develop on other lines and become a centre for establishing Trinidad and also ex-Trinidad resistant cacao trees. This will involve a replanting policy at Marper as and when required. A start has already been made in this direction, about 2 acres of cacao have been felled. In relation to this population, it is highly desirable—both to satisfy planters and Government—that as a duplicate planting of resistant strains should be undertaken in another heavily infected district. This land will require careful selection as regards location, tenure, accessibility, supervision, &c.

Disease in Immortelle Trees.

19. In 1934 the writer announced the discovery of this disease on the cacao shade trees, both the Anauco and the Bocare being susceptible. The causative organism of the trouble is *Calostilbe striispora* (Sacc) Seaver (Syn. *Sphaerostilbe musarum*—Ashby). At that time the main trouble was in the Sangre Grande district where periodical flooding is a constant feature, and it was pointed out that until a comprehensive drainage scheme was established, one could expect a continuance of this disease. It is understood that attention is now being paid to the problem of flood prevention in the area above-mentioned, and if successful work can be achieved in this respect, then not only will agriculture benefit, but also the whole of the people resident in the area, in that more sanitary and therefore health promoting conditions will be provided.

20. Sporadic cases of this same shade tree disease have since been found in many parts of the Island especially, where flood water is a periodical occurrence.

21. Now where the shade trees are obviously too numerous, the loss of scattered trees here and there is of no particular importance. But when groups of shade trees fail from any cause, including this particular facultative parasite, then the situation is different. Attention is again called to this disease because of mal-practices now in operation on many cacao properties. Since the inception of the Cacao Subsidy Scheme, much cultural work has been done in the cacao cultivations. Some of this work is drainage and round-ridging, weeding, pruning, &c. It is a fairly common practice in these operations, to use the bases of the shade trees as a dump for soil, weeds, debris, &c.

22. This is a very bad practice and should be discontinued. Where this system is in operation it is very desirable that all this material be removed from around the bases of the shade trees and placed elsewhere on the cacao beds. There can be little doubt that the heaping of soil, debris, &c., around the bases of the shade trees acts as a predisposing factor for the onset of the disease in Immortelles in that moisture collects in such places. No doubt much of this deposition of weeds, soil, prunings, &c., at the bases of the shade trees is done unthinkingly and unwittingly, but cacao proprietors are strongly urged to disallow this kind of work if they value their shade trees.

CITRUS.

23. The growing of citrus, mainly budded Marsh grapefruit, and to a small extent, budded oranges, has been in operation for some years. Soils and climatic conditions, appear, on the whole, to be well suited for this crop in Trinidad. Much trouble has been occasioned in the past from Gummosis and allied diseases of collar and roots. Now it is generally agreed that the successful growing of budded citrus requires attention to certain primary points, *viz.*: (1) determination that the water table will not, at any time, adversely affect the cultivation; (2) adequate drainage and round-ridging to be provided in the original layout; (3) suitable mounds to be made for the citrus plants; and (4) high budding.

24. One feels that if these points get proper attention, then gummosis, crown rot, &c., will be reduced by 75 per cent. and the trees live and crop at least twice as long as they have done hitherto.

Citrus Scab. (*Sphaceloma fawcetti*)

(*a*) *Santa Cruz Valley.*

25. It will be recalled that in the last report the writer announced that this disease had made its appearance on grapefruit in the Santa Cruz Valley in the Northern Range, where upwards of 300 acres are planted in the crop. These trees, on the average, are about five years old; hence most of them are cropping or about to crop. The Department sent two assistant inspectors to the district to supervise the work of destruction of infected sour orange and rough lemon trees in the neighbourhood. As a result of this work, 248 sour orange trees and 1,740 sour orange seedlings in nurseries have been destroyed; also 150 rough lemon trees and 25 rough lemon seedlings have been cut out and burnt.

26. A survey of the area has shown that 2,964 grapefruit trees have been found to be mildly infected. The affected twigs (with leaves) and fruits have been cut out and burnt.

(*b*) *Diego Martin district.*

27. It was pointed out in a previous report that the King orange was susceptible to this disease in Trinidad. Recently quite a large number of fruit of this orange were found affected in this district. The diseased tissues (fruits, foliage and associated twigs) were collected and destroyed.

(*c*) *Maraval district.*

28. One estate in this area has the affection on grapefruit. The disease appears to be well in hand. Affected fruit, &c., are regularly collected and destroyed and at present it is difficult to find any diseased tissues. All affected sour orange and rough lemon trees have been felled and it is expected that this will materially assist to stamp out the trouble.

Spraying Experiment to Control Scab.

29. In late May a small spraying experiment was instituted on one estate in the Santa Cruz Valley.

30. A two-acre block of the worst infected trees was selected one acre being sprayed and the adjacent acre being used as a control. At this time, a fair number of trees were just setting fruit following shedding of petals. A second spraying was undertaken on the same acre in mid-July. On this occasion, a much heavier flowering had just taken place. The spray fluid used was Burgundy Mixture (4-5-50), with the addition of milk.

31. Recent checking on the centre row of seven trees in the sprayed acre and a similar count on the centre row in the control plot indicates that spraying is most promising in controlling the malady.

32. The scabbed fruits on the sprayed plot average one per tree and on the unsprayed control plot the average number of scabbed fruits is 48 per tree.

33. It is expected that a complete check will be made of the crop on this site during the picking season and then growers will be in a position to know the economics of such work, under a given set of circumstances.

Leaf-Spots.

34. (*a*) *Mottle leaf.*—This affection occurs in a mild form on scattered trees in some cultivations. The exact cause is unknown. In some countries this trouble is quite common and is attributed to zinc deficiency.

35. (*b*) *Greasy-spot.*—This kind of spotting is exceedingly common. The spots appear as irregular slight swellings usually on the lower surfaces of the leaves. Generally, the spots have a dull greasy appearance and the colour brownish-black. The centres of the spots are somewhat raised and typically surrounded by a yellow band. The nature of these spots is unknown, but since no visible damage results, very little attention is given to them. In all probability the cause of the affection is nutritional.

" Splits " in Fruit.

36. Splitting of maturing fruit occurs to a small extent in some cultivations, especially where bird and insect life is abundant and this is generally where the citrus is surrounded by high woods (forests). The splitting is mostly observed in oranges, and the causes are : (1) Mechanical damage by labourers in cutlassing, &c., and (2) bird or insect injury, or both. It can be expected that when the labourers exercise more care and the fauna is better controlled, then this trouble will tend to disappear.

Thread-blight (*Corticium* Sp.)

37. This is occasionally found in very wet districts or following very wet periods of weather. Both orange and grapefruit trees are known to be susceptible hosts. Where present, the affected tissues require to be excised and if shade reduction is feasible it should receive attention. Fortunately in Trinidad, the citrus trees have reasonably good spacing and this should help to keep the disease at a low point. But in contemplated plantings in wet districts attention to wide spacing is advised.

Root Disease.

38. In recent months, a number of citrus trees, especially grapefruit in the early years of cropping, have been found dead or dying. Examination of the root systems reveals that in typical cases the laterals are heavily invaded with *Diplodia* Sp. Usually it appears that the lesions start at the terminals of the laterals and progress towards the collar.

39. Now *Diplodia* Spp. are generally classed as saprophytic or very weakly parasitic and it is still undetermined what part this Diplodia invasion represents in the complex. It is quite probable that some predisposing factor still to be determined, is responsible for the loss of trees. One might suggest that in some cases the high water table is involved; in other instances, unbalanced applications of artificial manures may be causative of the trouble.

BANANAS.

40. The banana industry, started a few years ago for the purpose of exporting the Gros Michel variety cannot be said to be very successful. The intention, at the commencement of the industry, was that it should function as a useful subsidiary. But since 1934, the leaf spotting fungus, *Cercospora musae* has spread practically throughout the Island and this, in conjunction with Panama disease (*Fusarium cubense*) has given the industry a serious set back ; in fact to-day it appears that these two diseases, plus the mediocre soils in which most of the stools are planted, will prove to be limiting factors to the successful and profitable growing of the crop.

Cercospora musae.

41. Bananas planted in poorish soil and exposed to the wind are particularly susceptible to the leaf-spot fungus. The above points to the great need of careful selection of land and environmental conditions for the crop. It is clear to all that a very high percentage of count bunches is essential for the grower to succeed with this crop ; hence if indifferent soils are planted, it is more than likely that that fact alone will eventually result in failure quite apart from the incidences of diseases and pests. Analysis of the situation points to this : that the greatest care should be exercised in selection of soils ; apparently only small pockets of highly fertile soils are to be found here and there ; also rainfall should be adequate and well distributed ; and the situation should be sheltered.

Panama Disease.

42. It is regrettable that the early scattered cases of this disease do not get prompt attention.

43. If this was the case a good deal of the spread of the affection would be avoided. Effective control measures are known for the disease where incidence is small, and the planting community have had every opportunity of familiarizing themselves with these methods. Of course, when stools contract the disease in a wholesale manner and large numbers die simultaneously, then such fields should be abandoned for bananas and alternative crops established.

44. In connection with banana diseases, the writer paid two visits to Grenada during the year and for the benefit of local planters a brief report of the situation in that Island is appended :—

45. Like other Islands in the Caribbean, Grenada initiated an export industry in this crop some three years ago. At that time (1) Panama disease was very little in evidence and fairly localized ; (2) nematodes were known to effect some amount of damage on practically all musaceous plants grown in Grenada ; (3) borers (weevils) were abundant on old stools of bananas and plantains ; (4) the leaf-spot fungus caused by *Cercospora musae* was unknown.

46. As in other territories, the Gros Michel in Grenada has been established at various elevations, and in soils of varying fertility. In some districts, conditions for growing the crop can be classed as good as regards soil, rainfall, transport, and other requirements. On the other hand, there are areas where low rainfall, soil fertility, and high winds, &c., operate in ways which are unsuitable for successful banana growing, and peasants and planters in such districts should be discouraged from growing the crop. In my experience, Grenada ranks high as an agricultural community especially in the growing of cacao. Forking and manuring lands are common practices when economic conditions permit and the general sanitation of most estates is good. Now these features are mentioned because it is mainly in cacao lands that the bananas are established. In the majority of cases interplanting is the rule, and it is well-known that the banana is a light-demanding plant. Hence there are limits to successful and profitable production if the banana plants do not secure adequate light requirements. In addition to the above, certain growers have established substantial acreages of pure stands of Gros Michel by a process of substitution for cacao. It is to be hoped that growers who own these pure stands will take steps to interplant permanent crops. Any permanent crop takes several years to put it into production and in the meantime attention to bananas could continue as usual.

Leaf Spot (*Cercospora musae*)— *Incidence and Distribution.*

47. At the present time (1937) the incidence of this specific fungus is mild and sporadic. Nowhere are plants affected to the extent one knows them to be in some parts of Trinidad, for example. This indicates that the trouble is of recent date in Grenada. To what extent, if any, musaceous plants other than Gros Michel are affected is a matter for further study. In nearly all cases, the middle and upper leaves are unaffected ; the trouble is mostly confined to the lower leaves. Only on one estate are to be found a few stools with fairly heavy infection and the Attorney was recommended to destroy such plants in the hope that by adopting this method the trouble would be arrested and further infection to the property delimited. To date, two affected blocks of Gros Michel are known to exist on one estate (Belvidere). In addition, the disease was found at Nianganfiax Estate ; also, peasants' bananas less than a mile, *i.e.* bee-line distant from Nianganfiax on the Grand Etang Road.

Control Measures.

48. For the control of the disease in Grenada one can, on general grounds, recommend (*a*) the destruction of all aerial parts of badly affected plants. These at present are very few and their destruction may well give protection to surrounding areas planted in bananas ; (*b*) stripping and destroying by burning or burying infected foliage. This applies to the stools where incidence is mild and scattered ; (*c*) cutting out (pruning) *surplus suckers* as they often harbour the parasite in quantity and thus jeopardise the fruiting possibilities of the older cropping plants. Incidentally, it is known by all up-to-date banana growers that judicious pruning of suckers promotes maximum cropping in minimum time, quite apart from the presence of any disease or pest.

49. An obvious corollary from the above is the need of continuous, systematic inspection of banana plants by all growers, large and small, to determine the presence or absence of the parasite involved.

Present Incidence and Distribution of Disease (*December*, 1937).

50. (*a*) *Panama Disease.*—In some districts this affection is becoming more noticeable. Planters generally have been taught how to diagnose the disease, but one feels that there is laxity in promptly dosing infected stools with Banana Disease Killer Oil. This tardiness in treatment will in time result in increasing damage ; hence it is again urged that small-holders and estate owners should be extremely vigilant in locating and adequately treating affected stools. There is a tendency among banana growers not to be too greatly concerned with the occasional failure of plants scattered here and there in the cultivations. But it is precisely attention to these early, sporadic cases of disease which is required if serious damage is to be averted.

51. (*b*) *Leaf-Spot* (*Cercospora musae*). When one takes into consideration the total planting of Gros Michel bananas in Grenada, one finds that only a very small percentage of them are at present attacked by this disease ; the vast majority of the plantings are still free of the affection.

52. The chief centres of incidence are (1) *The Belvidere Estate* at a high elevation and with a high rainfall. But even here there are only three or four very localized areas where the disease occurs. On this estate, there are still large blocks of bananas free or practically free of the disease. In this locality also are to be found sporadic instances of the disease in a mild form on small-holders properties. (2) *The Birch grove district.* As compared with (1) above this is a comparatively flat district and with a lower rainfall. Here the disease, both on estates and peasants' lands, is mostly of a mild form, the lower leaves only showing the effects of attack. In no place is cropping being affected as one finds in several areas in Trinidad.

53. This leaf-spot disease is essentially a seasonal one. In dry periods of weather the affection is arrested and in wet weather the effects of the parasite are very noticeable on the foliage.

Control of Cercospora musae (*leaf-spot*).

54. (*a*) *Natural control.*—Grenada is a mountainous Island. There are very numerous ridges of varying heights. These ridges are very useful in retarding the spread of disease such as this specific fungus parasite which is mainly wind-distributed. In addition, the Island has belts of nutmegs, cacao, forest, &c., in practically all parts where the bananas are established. Thus the local topography of broken, undulating lands and the permanent crops and forests function as barriers to the dissemination of the parasite. If Grenada had been flat land from end to end, and large areas had been planted in pure stands of Gros Michel, then the effects of *Cercospora* leaf-spot would most likely be serious and damage pronounced.

55. (*b*) *Artificial control.*—1. The writer recommended in the April report that stripping and destroying affected leaves should be put into operation. This system has been in operation for several months now and one feels that appreciable control is being secured. The estates are expected to do this work themselves ; and the Government has been assisting the peasants with labour and supervision. This work should be continued in the hope that by so doing the amount of inoculum will be at a minimum and thus ensure freedom from disease to the rest of the cultivations which as remarked earlier, represent by far the major portion of the banana plantings.

56.—2. The other recommendations made in the April report still hold good, *viz.* : destruction of all aerial parts of badly affected plants and the pruning of surplus affected suckers.

57.—3. *Spraying.*—It has been decided to inaugurate spraying experiments on a limited scale to determine the economics and efficacy of such work. To this end, use will be made of the fungicide, Colloidal Cuprous Oxide, recently put on the market by Imperial Chemical Industries, England. This material is now on order.

General.

58. In view of the fact that *Cercospora musae* has resulted in serious damage and loss in several countries, one views the *long run* effects of it in Grenada with considerable apprehension. Wherever this disease occurs, it must be regarded as *potentially* serious. Enormous sums of money have been spent by the United Fruit Co. in experimental control work in some of their territories and apparently no great success has been achieved.

59. Now in Grenada it is fortunate that a big percentage of the bananas are interplanted in cacao and other fields. This means that such plants are less liable to be attacked by leaf-spot than they would be in a pure stand of bananas. Where pure stands of Gros Michel do occur, the writer has already advocated the interplanting of permanent crops and this advice is tendered because : (*a*) It is doubtful if soil fertility is of such a kind in any part of Grenada as to visualize bananas as a permanent crop; the soils are not rich enough. Bananas both in Grenada and Trinidad can only be regarded as a catch-crop and wide-awake planters will already have made plans for permanent crops when they establish a pure stand of bananas ; (*b*) the presence of diseases and pests must be faced. Minor troubles such as "borers" (weevils) and nematodes are encountered ; and the major maladies, Panama disease and *Cercospora* leaf-spot can be devastating.

60. The above is not written to discourage the banana proposition in Grenada, but it is very necessary for everyone concerned to be conversant with the facts.

61. At present the banana project in Grenada is relatively small and could be extended in certain places and it is to the credit of some planters that considerable intensive cultural work is done in the growing of Gros Michel bananas. The writer has investigated the economics of banana growing in Grenada to some extent and is satisfied that where soil, supervision, transport, control of diseases and pests, and other factors which make for efficiency, get adequate attention, then profitable results can accrue. The banana industry, like any other industry, must be viewed from a business standpoint. Moreover, the recurrence of low prices for cacao should impress the planting community of the wisdom of crop diversification.

MISCELLANEOUS.

Tonka Bean (Dipteryx Odorata).

Mottle leaf.

62. Occasionally a tree is seen with mottling in a pronounced form. But the number of such trees is almost negligible. In appearance, the mottling is comparable to that found in citrus. Very little is known of this affection ; it cannot even be said that it is of economic importance. Maybe some nutrient deficiency is the cause ; or possibly a virus is involved. However, at present it can be stated that practically all tonka bean trees in the Colony are free from symptoms of mottling.

Thread blight.

63. In very wet districts and where shade is excessive, this disease is frequently found to a small extent. This crop does not require "wild" or other trees to be interplanted ; such practices are undesirable in every way. The type of thread-blight seen by the writer is the Marasmoid form with clamp-connections.

64. The method of controlling the trouble is to cut out and destroy affected tissues and reduce shade and shelter where feasible.

Stock damage.

65. Not infrequently one is called upon to diagnose and recommend treatment for what is termed stem canker. In nearly all cases the lesions are caused by live stock, and in plantings in or near high woods, deer, &c., are the culprits. Deer are especially addicted to damaging the bark of young, non-bearing trees. Some planters have provided bamboo collars for protection against attack by deer. Bearing trees are sometimes killed by stock gnawing the bark of the stems to the point of complete girdling. It should be obvious that to cope with this kind of damage planters should never tether stock to the trees, and furthermore, the access of stock to tonka bean fields should be discontinued.

Fasciated Growths.

66. These growths, caused by the fusion of tissues, are not uncommon in the tropics. During recent years specimens of this phenomenon have been fairly frequently submitted to the Department. No doubt the reason for drawing attention to these growths is that they simulate witch-broom tissues of cacao. But as a matter of fact fasciated tissues have no pathological significance. Examples of fasciation have been seen in mango, cassava, ochro, tonka bean, sapodilla, erythrina, coffee, &c.

F. STELL,
Plant Pathologist.

REPORT OF THE ENTOMOLOGIST FOR THE YEAR 1937.

I continued to make my headquarters during the year at the Imperial College of Tropical Agriculture. Towards the end of the period under review, a change of laboratory quarters was made, whereby considerable additions to working space were obtained. Thanks are due to Sir Geoffrey Evans, for his permission to make the alterations and to Dr. A. M. Adamson, Reader in Entomology, for his continued co-operation.

2. During the year I continued to serve on the Plant Quarantine Committee and acted as Entomologist to the Plant Quarantine Station for a period of five months, during the absence on leave of the Secretary.

SUGAR-CANE.

3. Work on the Amazon fly parasite (*Metagonistylum minense*) was continued. Unfortunately during my illness at the beginning of the year, the breeding stock of this fly died out owing to lack of supervision. The work was accordingly suspended until October, when a new stock of flies was obtained through the courtesy of the Director and Entomologist of the Puerto Rico Experiment Station. From the progeny of these flies, some three hundred were liberated in the cane fields before the close of the year.

4. Attacks of the Sugar-cane froghopper were locally severe during 1937, but on the whole the attacks were more diffuse than in 1936. According to reports received, some three thousand acres of cane were blighted to varying degrees, about one thousand acres being severely blighted.

5. Experiments in the use of pyrethrum dust for froghoppper control were continued, with gratifying results. Using a small power dusting machine, by means of which the dust was directed into the field from the trace without any attempt at individual treatment of the stools, between seventy-nine and eighty-four per cent. of the froghopper population present was killed in all cases. Arrangements have now been made, by means of a grant from the Colonial Development Fund, for practical trial of this method of froghopper control on a large scale during 1938.

6. Studies in varietal resistance of cane to froghopper attack were continued by Mr. Fennah of the Imperial College. As before, the degree of blight produced on the experiment areas was low, but the results in the main support the conclusions of earlier experiments. Mr. Fennah has also made laboratory studies on the canes and has obtained an indication that " stomatal number " may be an index to resistance.

COCOA.

7. Special attention has been paid to problems connected with the cocoa thrips. The incidence of this pest during the year has been small and scattered. As a result, many of the projected field experiments have failed to yield results owing to the complete absence of thrips from the neighbourhood of the treated areas.

8 An area of twenty acres in a district heavily attacked in the three preceding years was thoroughly sprayed with Bordeaux mixture. A surrounding area which had also proved susceptible to attack was left as an untreated control, but thrips failed to appear on either the sprayed or unsprayed portions. On a neighbouring site, an experiment was laid out to elucidate and to compare the effects on thrips incidence of manurial drainage and spraying treatment. The whole of this experimental block was free of thrips attack.

9. Population studies of the cocoa thrips were conducted in two blocks situated within a few yards of each other. One of these is normally subject to thrips attack while the other is rarely affected. It was found that, although the general thrips incidence was low, the plot susceptible to injury maintain a much higher thrips population than did the neighbouring plot. The indications are at the present time that the slightly affected plot has an appreciably drier atmosphere than the heavily affected one and that this fact is related to the rate of thrips increase.

10. Experiments were conducted on the use of insecticidal dust in controlling cocoa thrips. It was found that a light application of hydrated lime, applied with a power dusting machine produced a thrips mortality of over ninety per cent. The treated leaves remain coated with lime for several weeks in wet weather and this coating appears to act as a repellant preventing subsequent invasion. The cost of materials and of application is much less than in the csse of any wet spray and it is believed that a practical method for thrips control may be developed on these lines. Poison baits for rats and squirrels have received continued study. Sulphur matches were distributed throughout the year to all cocoa planters requiring them for rat control.

CITRUS.

11. In collaboration with the Plant Pathologist, a preliminary experiment was conducted on the use of dusts for the control of citrus scab. Materials for this experiment arrived too late for critical tests but the preliminary results are promising and such treatment would probably be much more economical than any method of wet spraying. The work will be repeated under more favourable conditions during the coming season.

12. Continued use of emulsions of local oil as insecticides for control of scale insects has been made. These preparations are increasing in popularity and appear to give uniformly successful results.

13. Owing to reports of the presence of the Mediterranean Fruit Fly (*Ceratitis capitata*) in parts of Venezuela, a survey of fruit flies in Trinidad, was conducted. Fruits of all kinds, including both wild and cultivated fruits, were collected from all parts of the island and the insects that emerged from them were preserved. In addition, trees and bushes were swept with a net and any insects found in this way were collected. The survey yielded some three thousand insects, mostly Trypetid flies of the genus *Anastrepha*, but not a single *Ceratitis* was observed.

14. The weevil *Cratosomus punctulatus* was observed to be damaging orange trees in one district and defoliation of oranges due to *Lachnosterna* sp. occurred on a small scale.

STORED PRODUCTS

15. Experiments on the storage of maize were continued, employing proprietary preservatives and the method, discussed in my report for 1936, of covering fumigated grain with a layer of fine sand. This last method still appears to be the most successful and an attempt has been made to convert it into a practical method for general use.

INVESTIGATIONS IN GRENADA AND CARRIACOU

16. As a result of an outbreak of *Orthezia praelonga* on limes in Carriacou, I visited the island at the end of June. The injury was found to be most serious and to be complicated in places by somewhat unfavourable growth conditions. Partial spraying of the affected trees was recommended and suggestions were made for the improvement of the general culture in collaboration with the Agricultural Officer Mr. Bain, of this Department and with Professor Hardy, of the Imperial College of Tropical Agriculture. During the ensuing months however, the abundance of the insects decreased very rapidly, apparently from natural causes, and spraying work was consequently suspended.

17. Experimental trial of pyrethrum as an alternative crop in Carriacou was suggested and seeds for this purpose were forwarded from the Royal Botanic Gardens, Kew.

18. A general investigation of the position as regard to insect pests in Grenada was made, during a brief visit en route from Carriacou to Trinidad. The crops particularly examined were sugar-cane, cacao and citrus.

19. Sugar-cane appears to be the crop most urgently in need of attention from the pest control point of view. While sugar-cane in Grenada is subject to attack by the Trinidad froghopper, *Tomaspis saccharina*, the most important pests of this crop are apparently moth-borers of the genus *Diatraea*. It was recommended that investigation of the possibilities of biological control should be made.

20. An effort was made to ascertain whether or not the cocoa thrips parasite *Dasyscapus parvipennis* had become established in Grenada, following its introduction some twelve months previously from Trinidad. At the time of my visit, cocoa thrips itself was extremely rare and, while the few thrips is covered were unparasitised, there is little information to show the status of the parasite. The cocoa pest of most general importance in Grenada appears to be the cocoa beetle *Steirastoma depressum*.

21. The most important pests of citrus in Grenada are those associated with lime cultivations, which are affected principally by the green scale, *Coccus viridis*. This, however, is kept in control on many estates by routine spraying. A beetle, probably *Diaprepes* sp., was observed on limes and both limes and grapefruit in a few instances were affected by *Orthezia praelonga*.

MISCELLANEOUS PESTS.

22. Experiments were conducted on the control of parasol ants. The use of "Cyanogas" for this purpose applied by means of a special pump was found to possess many advantages over the usual method of exploding the nest with carbon bisulphide. Particularly in the case of large ant colonies, this method is less costly and more certain in its results. The use of Cyanogas is now being adopted by the Department for routine destruction of ant nests.

23. Attention has been given during the year to control of the chinch bug, which is a troublesome pest of lawns in various parts of the colony. An emulsion of a locally produced oil has been found to give effective control when sprayed on the affected grass.

24. Shade trees in Port-of-Spain, have been sprayed for the control of insect pests on two occasions. The two cases were (*a*) attack of *Glyricidia* by *Orthezia praleonga* and (*b*) attack of *Ficus benjamina* by white flies. In both cases the trees were sprayed with oil emulsion and a single application was effective.

25. Peasant gardens in a land settlement near Rio Claro were severely attacked by a grasshopper, *Coscineuta virens*, which was completely defoliating cassava. The attack was checked by dusting with lead arsenate.

PARASITE SHIPMENTS.

26. Shipments were made of *Theresia claripalis* to Antigua for the control of the small moth borer on sugar-cane and of *Cryptognatha nodiceps* to Jamaica for the control of the coconut scale *Aspidiotus destructor*. The shipments to Jamaica were not entirerly satisfactory, as a large mortality occurred in transit and the work will be continued in 1938.

ADDRESSES.

27. An address was delivered to the District Agricultural Society, Sangre Grande, on the control of insect pests affecting local agricultural products.

ALAN PICKLES,
Entomologist.

REPORT OF THE SUGAR-CANE AGRONOMIST FOR—1937.

The scope of the work in Trinidad may conveniently be summarised under the following headings:—

1. Manurial Experiments.
2. Cultural Experiments.
3. Variety Trials.
4. Biochemical Investigations.
5. Soil Investigations.
6. Miscellaneous.
7. Publications.

1. MANURIAL EXPERIMENTS.

2. Some sixty field experiments with lime, nitrogen, potash, phosphate and pen manure were reaped during the course of the year. The results of these experiments have been set out in detail in my *Annual Report for* 1937 *on Field Experiments on Sugar-Cane in Trinidad* which has been published by the Sugar-Cane Investigation Committee. The main conclusions to be drawn from the experiments are outlined below.

Ground Limestone.

3. It has previously been shown that dressings of coarse limestone (35 per cent. through a 100 mesh B.S. sieve) can give rise to large initial gains in yield of cane but that the residual gains tend to be small. It appeared at one time that the beneficial effects of coarse limestone ceased with the fourth crop. The fifth residual gains, however, obtained during the 1937 crop, were found to be the largest of the residual effects so far recorded. It is noteworthy that the rainfall during the crop season 1937 is the heaviest so far registered for the experimental areas and it is probable that the excess moisture to some extent rendered available the coarse and less reactive particles of the dressings.

4. A finer grade of limestone (65 to 70 per cent. through a 100 mesh B.S. seive) has been found to give large and undiminished gains in yield over five successive crops. There are no indications that the beneficial effects of limestone of this quality have begun to diminish with time.

5. In 1936 indications were obtained that greater gain in yield of plant cane may result from applying lime after instead of before ploughing. The difference in favour of the later application has not been found to persist to the ratoon stage.

6. Dressings of ground limestone equal to the lime requirement of the soil have been found to give. —

(i) maximum gain in yield of cane at intermediate dressings of sulphate of ammonia in the presence of potash and absence of phosphate and minimum gain in yield at intermediate dressings of sulphate of ammonia in the absence of potash and of phosphate.

(ii) minimum gain in yield of cane at intermediate dressings of sulphate of ammonia in the presence of potash and of phosphate and maximum gain in yield at intermediate dressings of sulphate of ammonia in the absence of potash and the presence of phosphate.

The intermediate dressings of sulphate of ammonia lie in the region of $3\frac{1}{2}$ oz. to 7 oz. to the stool.

7. It has been confirmed that the full beneficial effects of dressings of limestone on yield of cane on acid, potash-deficient soils are not in general obtained in the absence of applied potash.

Sulphate of Ammonia.

8. Small dressings of ground limestone, applied with sulphate of ammonia to neutralise any harmful effects of the acidity which develops during transformation of the nitrogen, have not been found to exert appreciable beneficial effect on yield of plant canes.

9. Studies on the effects of size and time of application of dressings of sulphate of ammonia on yield of plant canes have been continued. It has been confirmed that a dressing at planting may or may not lead to an increase in yield. It has been found that a dressing at the time of first moulding may not have a beneficial effect provided that adequate nitrogen is applied when the banks are finally broken into the furrows, and that no advantage may be derived from dividing the total wet-season dressing into two doses. On the areas under experiment the optimum wet-season dressing of sulphate of ammonia to plant canes was found to be between 2 cwts. and 3 cwts. to the acre, and the optimum total dressing between 4 cwts. and 6 cwts.

10. It has been confirmed that, in general, the optimum dressing of sulphate of ammonia to ratoon canes lies in the region of 3 cwts. to the acre.

11. It has been shown that previous treatment of the soil with ground limestone, in the absence of applied phosphate and potash, may adversely limit the immediate gain in yield of ratoon canes and reduce to zero the residual gain in yield which can result from treatment with sulphate of ammonia.

12. In a direct comparison there was found little to choose between the gains in yield of plant canes resulting from treatment with sulphate of ammonia (whether in the presence or absence of applied limestone) and with cyanamide. The manures were buried in the furrows at the time the banks were broken.

13. In one experiment plant and ratoon canes of the varieties B.H.10 (12), B. 726 and Co. 213 showed greater response than Uba to relatively heavy dressings of sulphate of ammonia.

Potash.

14. It has again been confirmed that response in yield of sugar cane to potash and the optimum size of dressing of this manure are in general independent on the amount of exchangeable potash present in the soil (*see* paras. 54 and 55).

15. It has been shown that light dressings of potash may not give paying response in yield on soils highly deficient in potash. Under such conditions dressings of at least 2 cwts. of the manure would appear essential.

16. It has been confirmed that it pays to apply a dressing of potash to each ratoon crop as well as to the plant canes on potash-deficient soils.

17. It has been confirmed that the gain in yield resulting from treatment with potash is dependent on the size of dressing of nitrogen and that in general adequate nitrogen is essential for maximum response to potash.

18. It has been confirmed that in certain circumstances applied phosphate can adversely affect the gain from potash and the adverse effect is dependent on the size of dressing of phosphate. In other circumstances, however, the presence of applied phosphate appears essential if maximum response to potash is to be obtained. It has been shown that the nature of the effect of phosphate on the gain from potash can be dependent on both lime status of the soil and size of dressing of nitrogen.

19. Plant and ratoon canes of the variety B.H. 10 (12) have been found in one experiment to give smaller response in yield to potash than B 726, Co. 213 and Uba.

Superphosphate.

20. It has been found that response of sugar cane to treatment with superphosphate is dependent on a number of factors such as the lime, nitrogen and potash status of the soil, rather than on the amount of available phosphate present in the soil.

Pen Manure.

21. It has been shown that the effects of a single dressing of pen manure on yield of cane can be traced over a sequence of five crops.

22. Further measures are now available of the extent to which the immediate and residual gains resulting from treatment with pen manure are reduced by specific dressings of lime, nitrogen, potash and phosphate, alone and in various combinations.

2. CULTURAL EXPERIMENTS.

Preparatory Cultivation.

23. Under one set of conditions it has been found that gyrotilling the soil before planting does not lead to larger yields of plant, first-ratoon and second ratoon canes than chiselling.

24. A measure has been obtained of the gain in yield of plant and first-ratoon canes which results from cambering (grading) after ploughing.

Methods of Planting.

25. Planting in furrows has been found in general to give larger yields of plant canes, but not of ratoons, than planting on the flat.

26. There appears to be little to choose between planting in furrows or planting in holes when planting takes place very early in the wet season.

27. Significant gains in yield of plant canes have been obtained on two soil types as the number of plants across the cane bed is increased from four to eight.

Depth of Drains.

28. Deepening the drains between the cane beds from 15 inches to 30 inches shortly before the dry season following planting has been found to have a beneficial effect on yield of plant canes.

Mulching with Megasse.

29. Data are now available from three experiments in which megasse has been used as a soil mulch. In one experiment it was found that no harm resulted from applying the megasse within, as well as around, the plant cane stools, and that paying gain may not be obtained from a second-season dressing of sulphate of ammonia in the absence of a mulch. In the second experiment it was found essential to apply the mulch before the soil dries out to ensure maximum gain in yield of plant canes. In the third it was shown that mulching with megasse can have an important beneficial residual effect on the yield of ratoon canes, and that this residual effect can be significantly larger in the presence of applied sulphate of ammonia.

Forking of Ratoons.

30. It has been confirmed that annual forking of the soil in general has no immediate or cumulative effect on yield of ratoon cane.

3. VARIETY TRIALS.

31. Seven experiments comparing the varieties B.H. 10 (12) and B. 726 under a range of soil conditions as crop plants, wet-season plants and as ratoons were harvested in 1937. It was found in general that B. 726 can give a juice of better quality than B.H. 10 (12) during the first half of the crop. On a Naparima marl soil B. 726 was also found to give a larger yield of cane. On the other soil types, however, B. 726 was found definitely inferior in this respect and only on a degenerated alluvial soil did the better juice quality of B. 726 compensate for an inferior yield of cane.

32. Three experiments comparing varieties B.H. 10 (12) and P.O.J. 2878 as plant canes on alluvial soils were harvested. In one experiment P.O.J. 2878 was found to give much larger yields as wet-season plants than B.H. 10 (12) whether reaped early, late or in mid-crop. The remaining experiments enabled a preliminary comparison of the varieties as crop plants on irrigated areas.

33. In one experiment the variety Uba was found inferior to B. 726, B.H. 10 (12) and Co. 213 as plant and ratoon canes on a degenerated alluvial soil.

34. In experiments on a Naparima marl and on an alluvial soil the variety Diamond 10 has not on the average shown great promise.

35. In an experiment on a degenerated alluvial soil the variety Co. 213 has been found to give more, satisfactory results than Uba but less satisfactory results than B. 726 as plant and ratoon canes. On an irrigated alluvial soil Co. 213 has been found superior to Co. 281 and P.O.J. 36 as crop plants.

36. In preliminary experiments on alluvial soils the recently introduced variety Co. 290 has been found to give very promising results as crop plants.

4. BIOCHEMICAL INVESTIGATIONS.

Crop Quality.

37. An account of the effects of manurial treatment with ground limestone on yield of available and commercial 96° sugar has been published in *Tropical Agriculture*, Vol. XIV, No. 3, pp. 63-69. The information recorded in this paper covers the period 1929-36.

38. A summary of the data obtained from the experiments on crop quality harvested this year has been published in my *Annual Report* for 1937 to the Sugar-Cane Investigation Committee.

39. The main additional conclusions to be drawn from the investigations with limestone, and from the experiments reaped in 1937, are outlined below.

Ground limestone.

40. Under conditions very favourable to ripening the effect of size of dressing on yield of commercial 96° sugar appears to be determined primarily by the influence of the dressing on crop quality rather than on yield of cane. The curve for yield of sugar rises to a maximum and then significantly falls as the dressing of ground limestone is increased. The position of the maximum point on the curve and the magnitude of the adverse effect on overliming, however, are dependent on the gain in yield of cane which results from liming.

41. Under conditions favourable to ripening gain in yield of sugar is controlled by the effect of size of dressing of lime on yield of cane, the concentration of available sugar in the cane being unaffected by liming.

42. Under conditions unfavourable to ripening gain in yield of sugar appears in general to be dependent primarily on the effect of liming on yield of cane rather than on crop quality, for in three experiments out of four the adverse effects of manurial treatment with limestone on the concentration of available sugar in cane were not important in comparison with its beneficial effects on yield of cane.

43. Under the conditions which obtain in Trinidad it would appear that a dressing of ground limestone equal to half the lime requirement of the soil can be relied on to give satisfactory gain in yield of sugar. It is probable that a dressing as large as the lime requirement may in general be applied without disadvantage but a dressing in excess of the lime requirement appears definitely inadvisable.

Sulphate of Ammonia

44. It has previously been shown that time of application of dressings of sulphate of ammonia to plant canes and ratoons can effect the quality of the crop. It has now been found that the effect of this manure is also dependent on the time of reaping of the crop in the dry season.

45. A total dressing of 6 cwts. to the acre of sulphate of ammonia was found to have no adverse effect on the quality of plant canes of variety Uba when reaped in the middle of the crop season.

46. A dressing of 3 cwts. to the acre of sulphate of ammonia was found to have a depressing effect on the quality of ratoon canes of variety Uba reaped early in the crop season. Nevertheless the gain in yield of cane resulting from the dressing far more than compensated for the fall in quality.

47. In a comparative trial a dressing of 5 cwts. to the acre of sulphate of ammonia was found to have a greater adverse effect on the quality of ratoon cane of the variety B.H. 10 (12) than of the varieties B. 726, Co. 213 and Uba when reaped in the middle of the crop season. In compensation, however, the gain in yield of ratoon cane of the variety B.H. 10 (12) was the largest.

48. It has been confirmed that it does not pay to apply dressings as large as 5 cwts. to the acre of sulphate of ammonia to ratoon canes.

Potash.

49. It has been confirmed that early dressings of potash can in certain circumstances have well-defined beneficial effects on the quality of plant and ratoon canes.

Superphosphate.

50. The effects of superphosphate on crop quality appear at present to be irregular. Under some conditions the effect of this manure has been found to be beneficial and under others adverse.

Pen Manure.

51. It has been found that the adverse effects of pen manure on crop quality can to some extent persist to the second-ratoon crop.

Tillage treatment.

52. It has been found that tillage of ratoon canes can have a serious adverse effect on the quality of the crop if reaped early in the dry season and that this adverse effect may not be offset by a gain in yield.

Leaf Analyses.

53. Investigations on the relationship between soil deficiencies and leaf composition of the varieties B.H. 10 (12), B, 726, Uba and Co. 213 are being continued.

5. SOIL INVESTIGATIONS.

54. As a result of field experiments reaped in 1936, coupled with soil analyses, it is now possible to make definite recommendations for the manurial treatment with potash of plant canes. Provided that the total dressing of sulphate of ammonia to the acre is not less than 5 cwts.

(i) response in yield to dressings of potash is doubtful if the soil contains more than 90 parts per million of exchangeable K_2O ;

(ii) paying response should result from dressings of one cwt. of potash to the acre if the soil contains from 55 to 90 parts per million of exchangeable K_2O ;

(iii) paying response should result from dressings of two or more cwts. of potash to the acre if the soil contains less than 55 parts per million of exchangeable K_2O.

55. If it is necessary to apply potash to plant canes, it is also advisable to apply at least one cwt. of this manure to each of the ratoon crops which follow. The dressing to ratoons in general may be increased with advantage to one and a half cwts. or two cwts. when the amount available potash in the soil is less than 55 parts per million exchangeable K_2O.

56. It is essential for the potash to be applied early in the life of both plant canes and ratoons.

Soil Surveys.

57. The field-to-field soil surveys, which were mentioned in my Annual Reports for 1935 and 1936, are still actively under way and have been extended to two more estates. The manurial programmes with lime and potash on the interested estates are based on the results of these surveys.

6. MISCELLANEOUS.

58. An intransit visit was paid to Grenada in April to supervise the experimental scheme in operation in that island and to decide on its future course.

59. I was absent from the island on vacation leave from the second half of June to the middle of November.

7. PUBLICATIONS.

Field experiments on sugar-cane in Trinidad. Annual Report for 1937.

Recent investigations on sugar-cane and sugar-cane soils in Trinidad.—III. Effects of manurial treatment with ground limestone on crop quality and yield of commercial sugar (concluded). *Tropical Agriculture,* Vol. XIV, No. 3 pp. 63-69.

P. E. TURNER,
Sugar-Cane Agronomist.

WILT DISEASE OF COCONUTS, 1937.

During the year, with abnormally dry weather experienced, palms continued to die on the soils subject to drying out. A large acreage has already been converted to other crops and there is not a very large acreage of coconuts now left on this type of soil. On soils subject to water-logging, deaths were not as as severe.

2. During the year a bulletin embodying the results of the work performed on this disease was published. The following points emerge from a discussion of the various factors measured as affecting palms in the various soil classes.

1.—(*a*) The factor to be particularly stressed is a water deficiency in the plant.

(*b*) In healthy areas conditions usually lead to a uniform moisture supply to the palm. In dry periods shortage of moisture comes on gradually.

(*c*) On soils subject to water-logging, a time is reached when the balance between root and shoot growth is upset due to destruction of roots by water-logging. In ensuing dry period a rapid shut off in moisture supplied to the palm occurs. In conjunction with increased transpirational losses, a rapid water deficit in the palm occurs.

(*d*) On light soils, water supply in the dry season is cut off rapidly due to quick drying out of soil to a fair depth. In conjunction with transpirational losses, which are excessive due to a low potassium status of these palms, a rapid water deficit in the palm occurs.

(*e*) On soils with an intolerant subsoil layer, soil in restricted root zone dries out rapidly, and palms which have made exceptionally good vegetative growth due to a high nutrient status of soils, are subjected to a rapid moisture shortage leading to a rapid water deficit in the palm.

(*f*) Nutrient status, while being important as a contributing factor is secondary to the water deficiency.

(*g*) A delay between the drying out process and the symptoms of bronzing may occur.

(*h*) Cutting off air supply to root system of palms produces the same symptoms as the disease.

(*i*) Spreading of the disease in wind direction may be explained from a consideration of transpirational losses.

(*j*) Rapid death of palm is due to the presence of only one growing point.

2. Curative methods are impossible under field conditions.

3. Preventative measures are recommended as follows :—

Areas subject to water-logging.

(*a*) Deep draining and banking of beds.
(*b*) Trenching.
(*c*) Liming.

Sandy Areas.

(*a*) Irrigation.
(*b*) Trenching and mulching.
(*c*) Potash manuring.
(*d*) Wider distance of planting.

4. In areas subject to water-logging or with an intolerant subsoil zone, sugar cane is recommended as an alternative crop. In the sandy areas, the tonca bean is recommended.

5. The evidence submitted is considered as leading to the view that Bronze Leaf Wilt is due to unsatisfactory conditions of water supply within the tissues of the palm.

F. M. BAIN,
Agricultural Officer.

CITRUS STUDIES FOR 1937.

In my last report it was stated that successful attempts at inducing early bearing of grapefruit trees as well as the holding on of fruit for a period of two months with very little loss, had been carried out by irrigation at Macqueripe Estates, Ltd. It was not possible, however, to gauge the effect of the treatment on the crop growth and yield in so short a space of time. It was therefore decided to discontinue the the treatment for last season, so that the differences in these respects for treated areas as against controls might be observed.

2. In the area where continuous irrigation had been carried out to hold on fruit, the trees put on such exceptional growth, that eight year old trees were intertwining at 25 feet apart. Pruning had to be done to ensure the entry of light and proper aeration within the plant canopy.

3. The trees are carrying a very much heavier crop than the control area, but the size of the fruit is very large. This is to be expected, as the amount of irrigation had to be heavy for the original purpose of the experiment.

4. In the area where trees were induced to early bearing, only two irrigations at intervals of six weeks were given. These trees have also put on much more growth than the controls, but no pruning was necessary. The crop is very much larger than for the control area, and the size and quality of fruit is excellent. No comparative figures for yields can be given as the crop has not been reaped as yet.

5. It would appear from these trials that in the area under consideration, water is a limiting factor to both crop growth and yield and the orchard is likely to benefit greatly from an irrigation or perhaps two irrigations each season. Further evidence in favour of this is the fact that 12 year old trees are already beginning to show serious signs of physiological die-back.

Citrus Root-rot.

6. During the year it was observed that eight year old trees in certain areas of this plantation were dying out, a severe yellowing of leaves being first observed, particularly on the fruiting branches. Investigation revealed that there was a rotting of roots, starting from the tips, there being no collar infection. Investigation by the Plant Pathologist revealed the absence of any parasitic organism, so a physiological reason for the disease must be obtained.

7. The earth around a few trees was dug away and the rotted portions of roots cut away and the freshly cut surface treated with an antiseptic solution. The earth was then put back and rammed tightly. The trees were pruned back to balance root and shoot and treated with 4 lbs. per tree of an equal mixture of sulphate of Ammonia and Potassium Sulphate. Some trees appeared to make some recovery.

8. As the trouble has become more serious recently, experiments on a more pretensive scale will be laid down, as well as leaf analyses carried out on comparable healthy and affected material.

F. M. BAIN,
Agricultural Officer.

PART III.

ANNEXURES.

	Page.
Revenue and Expenditure	78
Agricultural Exports, Trinidad and Tobgao	79
Annual Rainfall, Port-of-Spain, Trinidad	80
Agricultural Labour—Rates of Wages	81

PART III—ANNEXURES.

APPENDIX A.

Revenue and Expenditure.

	Expenditure. £ s. d.	*Revenue.* £ s. d.
HEAD OFFICE :		
Personal Emoluments	8,875 8 4	—
Travelling and other Charges	406 8 10	50 0 0
Laboratory Expenses and Field Experiments	1,340 10 2½	10 0 0
BOTANICAL DEPARTMENT, TRINIDAD :		
Personal Emoluments	396 2 9	—
Upkeep Royal Botanic Gardens and St. Clair Station ...	2,072 3 7½	
Care of Trees on Government Lands	106 6 6	
Upkeep Red House Grounds	91 11 11½	
BOTANICAL DEPARTMENT, TOBAGO :		
Personal Emoluments, Travelling	151 10 6½	88 10 7½
Maintenance, Botanic Station and Government House Grounds	399 19 5	
ST. AUGUSTINE NURSERY :		
Personal Emoluments	950 0 0	
Maintenance and Other Charges	3,050 19 4½	2,335 1 2½
MARPER FARM :		
Maintenance	909 19 10	639 4 5
RIVER ESTATE :		
Personal Emoluments	1,092 10 0	
General Maintenance, &c.	4,274 18 5	
Improvements	355 1 8	5,341 17 4½
ST. AUGUSTINE EXPERIMENT STATION :		
Personal Emoluments	830 0 0	
Maintenance, Cultivation of Crops, &c.	1,702 18 6½	213 6 1
GOVERNMENT FARM, TRINIDAD :		
Personal Emoluments	885 0 0	
Maintenance	5,602 9 0	
Purchase of Stock (Trinidad and Tobago)	901 13 6	6,257 2 11
GOVERNMENT FARM, TOBAGO :		
Personal Emoluments	100 0 0	
Maintenance	924 7 5	478 10 10
GOVERNMENT VETERINARY SURGEON :		
Assistant Examiners and Contingencies	1,055 7 8½	
Paralytic rabies	511 8 11	1864 2 1
QUEEN'S PARK AND PASTURES :		
Personal Emoluments	243 12 7	
Maintenance	1,338 2 10	
Improvements Queen's Park Savannah	746 2 8	247 5 3
DISTRICT SERVICE :		
Personal Emoluments, Travelling, &c.	6,285 2 9	
PLANT PROTECTION ORDINANCE :		
Control of Plant Diseases and Pests	4,316 12 8	
AGRICULTURAL CREDIT SOCIETIES :		
Travelling, &c.	123 13 0½	
TOBAGO ABATTOIR :		
Maintenance, Travelling, &c.	123 8 5½	63 0 5
SOIL SURVEY :		
Maintenance	743 6 7½	
Total	£50,906 18 2	£17,588 1 3

APPENDIX B.

Principal Agricultural Exports, Trinidad and Tobago.

	1937.		1936.	
	Quantity.	Value.	Quantity.	Value.
CACAO :		£		£
Raw Cacao	26,258,622 lb.	643,123	28,339,195 lb.	487,578
SUGAR CANE AND PRODUCTS :				
Vacuum pan, Grey Crystal	120,552 tons.	1,059,420	118,372 tons	965,334
Do. White Crystal	....	....	...	...
Do. Yellow Crystal	15,882 tons	168,585	20,415 tons	260,570
Molasses Crystal	2,498 tons	17,726	...	...
Yellow Crystal Molasses	3,813 tons	28,288	3,843 tons	45,691
Molasses	4,258,934 gals.	45,953	3,909,009 gals.	41,623
Rum	109,860 gals.	18,720	90,185 gals.	20,449
Bitters	12,870 gals.	23,537	8,954 gals.	15,953
COCONUT AND PRODUCTS :				
Coconuts	5,020,665 No.	20,693	4,560,180 No.	14,529
Copra	17,277,008 lb.	113,083	9,438,240 lb.	51,798
Coconut Oil	19,918 gals.	2,292	9,437 gals.	1,343
COFFEE :				
Raw Coffee	1,752,882 lb.	28,074	1,213,102 lb.	17,702
TONKA BEANS	71,539 lb.	21,593	92,719 lb.	31,002
RUBBER :				
Raw Rubber	175,648 lb.	7,644	103,760 lb.	2,825
LIMES :				
Limes	923¾ brls.	1,592	1,391 brls.	2,472
Pickled Limes	...	...	...	...
Lime Juice	30,862 gals.	2,100	70,402 gals.	5,079
Lime Oil	47,651 lb.	48,098	22,795 gals.	19,132
Citrate of Lime	203,728 lb.	2,358	23,716 lb.	169
GRAIN, PULSE, STARCHES, &c.				
Corn (Maize)	48,272 lb.	225	34,263 lb.	142
Peas and Beans	250,320 lb.	1,737	623,980 lb.	2,600
FRUIT :				
Grapefruit	45,772 boxes	39,078	42,958 boxes	41,357
Grapefruit—Hearts and Juice (Canned)...	....	8,654	...	4,081
Oranges	3,116,970 No.	3,674	3,816,749 No.	4,754
Bananas	157,740 No.	16,027	159,076 No.	14,797
Other Kinds	...	37	...	149
MISCELLANEOUS :				
Plants and Seeds	...	257	...	403
Spices (Nutmegs)	10,668 lb.	122	16,814 lb.	312
Honey	17,569 lb.	169	38,178 lb.	470
Live Stock	77 No.	988	70 No.	804
Hides and Skins	1,725 cwt.	3,620	3,955 cwt.	6,413
Leather (unmanufactured)	4,480 lb.	246	2,912 lb.	116
		£2,327,713		£2,064,630

APPENDIX C.

ANNUAL RAINFALL 1862 TO 1937, PORT-OF-SPAIN, TRINIDAD.

1862 to 1899 at the Royal Botanic Gardens. January, 1900 onwards at the closely adjacent St. Clair Experiment Station.

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Rainfall.
	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Inches.
1862 ..	..	.66	.77	.25	1.41	8.47	10.36	9.57	11.97	6.60	10.06	3.03	63.15
1863 ..	1.54	2.71	1.45	.85	1.26	9.12	10.12	10.53	12.11	6.24	4.30	6.57	66 80
1864 ..	2.51	.53	.36	.04	8.15	4.96	7.17	12.06	8.04	6.53	5.94	6.61	62.90
1865 ..	2.62	3.20	1.07	7.98	3.22	5.64	10.35	14.83	7.32	14.62	4.81	9.62	85.28
1866 ..	2.24	3.91	1.44	1.09	1.45	6.59	7.83	12.34	5.87	10.11	8.17	6.82	67.86
1867 ..	1.31	6.36	.83	1.32	2.33	5.30	12.20	15.21	10.45	7.87	.67	2.71	66.56
1868 ..	2.06	.82	3.20	.64	4.17	7.78	11.35	6.73	5.46	4.66	8.31	1.03	56.21
1869 ..	.08	.93	.74	.41	.69	5.52	10.17	8.74	8.86	5.15	6.30	5.87	53.46
1870 ..	2.61	.56	1.46	1.51	4.65	8.81	11.91	9.00	10.63	3.98	5.94	8.29	69.35
1871 ..	6.62	1.40	2.89	.92	3.97	8.84	11.73	12.97	7.87	4.37	10.73	3.27	75.58
1872 ..	1.45	.07	.74	.39	3.14	7.09	5.45	10.82	3.07	4.80	9.89	3.04	49.95
1873 ..	1.78	1.08	1.98	.53	..	4.31	5.04	8.37	5.80	10.34	3.48	1.31	44.02
1874 ..	3.47	1.96	3.67	5.16	2.51	12.28	12.28	11.20	9.38	6.42	3.66	4.29	76.28
1875 ..	3.39	.91	.56	.42	2.61	4.15	12.62	7.22	11.95	10.85	3.74	2.48	60.90
1876 ..	3.26	1.03	1.78	1.67	6.65	11.17	12.23	15.18	12.03	7.04	5.95	3.96	81.95
1877 ..	2.14	..	7.46	3.38	3.19	8.43	8.35	12.94	6.39	6.68	7.66	5.48	72.10
1878 ..	3.44	.70	..	3.22	4.99	5.78	5.42	8.88	11.15	5.89	8.72	3.05	61.24
1879 ..	1.52	2.76	4.56	3.03	3.08	14.92	6.86	10.35	6.15	3.54	4.28	4.38	65.43
1880 ..	11.72	6.53	.67	2.32	3.90	7.83	6.30	17.39	7.47	5.74	10.51	1.96	82.34
1881 ..	.57	.65	.23	1.60	4.66	11.05	7.82	10.90	10.59	3.36	12.06	2.23	65.72
1882 ..	1.33	2.38	.73	1.57	3.74	6.33	5.93	8.40	4.93	5.86	10.29	1.50	52.99
1883 ..	1.56	.71	.26	3.37	5.89	10.91	13.66	10.26	5.53	3.99	6.06	8.30	70.50
1884 ..	3.43	2.50	4.40	1.51	2.91	6.84	5.71	8.70	5.03	5.05	5.14	5.66	56.88
1885 ..	1.30	.89	1.49	.43	5.27	3.44	5.87	4.56	6.08	4.08	5.37	4.44	43 22
1886 ..	3.32	1.97	3.27	3.83	4.49	9.70	17.48	8.15	6.73	12.59	8.54	6.75	86.82
1887 ..	2.69	1.46	1.67	1.08	3.98	7.40	5.51	9.93	5.07	5.84	7.60	11.86	64.09
1888 ..	8.37	1.79	2.41	2.28	3.46	11.92	6.89	7.02	5.53	5.06	7.76	2.95	65.44
1889 ..	.94	.85	4.16	1.05	6.34	11.66	12.14	11.73	3 76	6.30	7.38	7.48	73.79
1890 ..	7.76	.51	2.09	7.62	5.14	9.68	12.89	11.65	3.37	10.98	5.93	5.28	82.90
1891 ..	3.17	.92	.03	1.44	2.54	5.54	11.88	4.26	7.44	5.77	6.66	4.09	53.74
1892 ..	1.93	2.19	1.85	7.59	11.55	16.26	15.55	9.21	3.57	11.49	5.40	4.69	91.28
1893 ..	3.43	1.85	.19	3.61	11.35	10.19	13.28	16.32	11.73	5.47	7.84	7.23	92.49
1894 ..	3.22	2.36	3.12	1.22	2.69	3.26	4.53	12.06	5.48	3.93	7.28	3.16	52.31
1895 ..	2.52	1.33	2,27	2.52	2.11	5.00	2 57	4.86	5.69	10.89	15.15	7.32	62.23
1896 ..	7.08	.88	1.59	2.33	1.62	10.29	6.35	7.66	6.46	6.05	9.81	6.33	66.45
1897 ..	1.67	.75	3.96	.26	5.58	11.19	13.88	7.90	9.83	8.87	9.39	4.40	77.68
1898 ..	3.05	2.18	2.10	1.17	1.49	6.46	5.87	10.55	7.13	6.15	9.13	3.57	58.85
1899 ..	1.95	1.82	1.00	.75	.52	7.63	4.44	8.45	2.18	6.34	8.07	3.61	46.76
1900 ..	3.56	.76	2.72	4.10	4.14	12.99	7.95	11.07	5.52	6.53	5.41	2.61	67.36
1901 ..	1.95	1.51	1.85	.35	6.45	9.21	8.38	7.53	4.26	4.97	7.93	4.83	59.22
1902 ..	2.56	.51	1.18	1.78	2.14	10.05	5.20	11.67	7.22	7.40	2.74	2.89	55.34
1903 ..	1.51	.68	1 54	2.17	.95	5.42	9.40	9.45	11.41	2.12	2.59	4.20	51.44
1904 ..	3.00	2.56	4.24	2.50	2.76	6.23	8.03	4.72	8.81	5.65	3.61	4.32	56.43
1905 ..	2.41	.59	3.74	1.79	4.34	6.01	9.49	11.09	10.43	6.94	10.69	4.16	71.68
1906 ..	.43	.50	.73	.46	7.96	10.95	11.42	8.55	6.54	6.80	5.00	5.64	64.98
1907 ..	5.22	.44	1.71	.09	4.58	11.01	11.02	5.77	7.76	7.65	10.69	4.10	70.04
1908 ..	.75	.45	1.79	.95	5.82	5.22	5.87	7.72	5.45	5.45	2.65	8.68	50.80
1909 ..	5.69	2.43	1.15	1.78	3.87	8.31	10.72	6 29	6.95	7.15	3.93	6.31	64.58
1910 ..	2.79	4.38	1.75	2.01	2.76	6.34	6.40	13.89	8.27	9.21	8.49	1.90	68.19
1911 ..	1.61	1.51	1.86	.74	1.27	7.15	5.20	13.68	4.03	10.22	3.57	3.53	54.37
1912 ..	.62	Nil.	.74	.03	2.18	7.54	12.16	5.56	5.87	2.73	6.28	5.64	49.35
1913 ..	2.80	.50	1.42	.42	1.79	2.80	2.86	6.48	6.52	3.51	8.61	1.82	39.53
1914 ..	.50	.61	1.28	1.01	2.05	7.34	5.05	9.15	7.80	6.14	7.61	5.58	54.12
1915 ..	2.10	.66	..	2.63	2.76	7.05	12.76	5.27	4.21	9.28	7.84	1 75	58.31
1916 ..	5.29	1.35	1.57	1.91	.94	10.30	8.04	11.57	10.78	6.68	9.32	1.98	69.73
1917 ..	1.17	3.06	1.38	.50	4.24	6.30	10.13	9.96	7.24	5.43	6.61	8.22	64.24
1918 ..	3.15	1.18	1.48	1.27	2.94	5.87	14.42	8.56	8.93	5.51	7.56	3.85	64.72
1919 ..	.62	..	1.78	1.67	3.50	6.78	5 17	6.82	7.96	7.79	8.42	6.67	57.18
1920 ..	1.39	1.66	.94	.28	.56	4.13	4.93	6.70	10.98	5.74	6.03	1.60	44.94
1921 ..	2.43	1.60	5.03	4.09	1.43	9.91	10.06	10.30	10.1	6.53	7.71	6.25	75.51
1922 ..	4.01	1.13	1.41	2.39	2.18	6.10	5.06	8.35	6.49	2.92	11.17	7.10	58 31
1923 ..	1.91	1.66	.96	2.97	1.46	3.48	10.76	9.37	6.23	4.41	7.38	7.32	57.91
1924 ..	1.54	.90	.14	1.11	.73	4.95	7.53	7.27	4.59	7.81	8.56	2.15	47.28
1925 ..	1.77	1.06	2.67	.10	1.21	4.20	7.58	8.87	6.37	5.85	5.36	4.36	49.40
1926 ..	.69	.39	.54	.23	2.12	5.26	5.25	10.85	11.20	14.78	9.71	7.56	68.58
1927 ..	4.71	4.44	3.62	5.04	7.15	6.95	9.40	11.67	9.11	6.13	5.64	7.21	81.07
1928 ..	4.22	.69	2.31	2.02	.67	5.75	8.07	8.66	7.36	9.13	8.42	5.94	63.24
1929 ..	.84	.84	1.78	.81	7.33	6.43	5.10	8.90	5.21	3.40	9.30	1.51	51.45
1930 ..	2.70	.08	.31	2.38	1.85	6.35	7 12	4.94	5.82	6.27	2.59	4.87	45.28
1931 ..	1.68	1.11	.07	.29	1.12	6.94	10.96	8.89	4.85	6.59	7.94	5.77	56.21
1932 ..	5.61	1·72	4.33	3.99	9.25	10.53	5.80	16.04	3.85	4.60	10.23	8.01	83.96
1933 ..	3.87	1.25	1.91	1.36	2 85	10.19	9.93	16.07	11.52	7.41	5.38	6.29	78.03
1934 ..	2.51	.90	.7	.17	.82	3 05	9.43	7 24	6.55	8.50	10.08	5.30	55.35
1935 ..	0.53	0.57	1.23	1.4	5.03	2.36	7.35	13.23	11.41	3.82	11.25	3.45	60.65
1936 ..	1.16	0.28	0.11	2.43	5.62	10.52	11.33	5.93	8.13	4.95	7.06	5.53	63.05
1937	3.62	1.24	.70	2.59	.20	4.33	7.09	8.69	5.41	4.17	12.08	7.88	58.00
Grand Total .	207.51	109.31	135.16	141.19	265.72	576.14	662.41	733.67	557.28	499.67	553.42	371.40	4,811.40
Av. for 76 years	2.73	1.44	1.78	1.86	3.49	7.58	8.71	9.65	7.33	6.57	7.28	4.89	63.31

APPENDIX D.

AGRICULTURAL LABOUR.

RATES OF WAGES.

The following table gives the wage rates in force on agricultural estates at the end of 1937.

SUGAR.

Factory Workers.

Skilled Labour	...$1.00 to $1.60 per day, 8-8½ hours.
Semi-Skilled Labour	...$ 70 to $ .95 per day, 8-8½ hours.
Unskilled Labour	...$ 55 to $ .65 per day, 8-8½ hours.

Cultivation.

Operation.	*Size of Task.*	*Rate.*	*Average daily earning.*
Cutlassing	30 rods	35c.	35-40c.
Forking	18-20 rods ...	45c.	45-65c.
Banking	28-32 banks ...	45c.	45-65c.
Lining	Per acre	40-45c.	80-1.00
Planting	1,200/1,500 plants	40-45c.	45-60c.
Cutting Plants	1,000/1,200 plants	35c.	35-50c.
Draining	25/30/40c. per chain	—	80-1.00.
Weeding	Varies	35c.	35-50c.
Carting Pen Manure	8-9c. per ton. ...	—	70c.
Head Pen Manure	150 baskets ...	35c.	35c.
Cutting canes	Varies	35c.	35-70c.
Carting Canes	14c. per ton ...	—	Cartermen 80-1.00. Loaders 40-50c.
Small Gang	day of eight hours...	20-30c.	—
Applying Artificial Manure	do. do. ...	25c.	—
Stockkeepers	do. do. ...	75-90c.	—
Stockmen	do. do. ...	50-55c.	—
Grooms	do. do. ...	50-60c.	—
Tractor Drivers	do. do. ...	$1.60-1.90	—
Ploughmen	do. do. ...	80c.	—
Watchmen	do. do. ...	50-55c.	—
Loading.—Derrick hands	do. do. ...	55-60c.	—

COCOA.

Cutlassing per 100 trees		...40c.-50c.
Pruning per 100 trees ...	...Light	...50c.-65c.
	Heavy	...80c.-1.20.
Draining per 100 feet ...	...Lateral	...40c.-60c.
	Main	...40c.-$1.00.
Picking and breaking		...60c.-$2.40 per barrel depending on the quantity of ripe cocoa at the time of picking.

Day rates average approximately 45c. for an 8-8½ hour day for men and 30c.-35c. for women.

On coconut, citrus and other estates the rates paid follow generally those paid on cocoa estates.

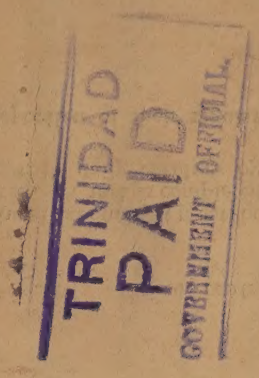
GOVERNMENT ESTATES.

Minimum rates for an eight hour day :—

Port-of-Spain ... ... 60 cents. Country ... ... 45 cents.

NOTE.—In estimating the average daily earnings of any class of agricultural labourer it must be remembered that the greater part of the work performed on estates is task work. A task is completed in approximately four to five hours and labourers can, if they so desire, increase their daily earnings by undertaking an additional half a task or a second task.

In addition to actual cash payments, a number of estates provide a proportion of their regular labourers with free barrack accommodation, fuel and other perquisites.


TRINIDAD
PAID
GOVERNMENT OFFICIAL